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U.S. Department of Energy
Idaho Operations Office

Tank Farm Soil and Groundwater Field Sampling Plan for the Operable Unit 3-14 Remedial Investigation/Feasibility Study

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ABSTRACT

This Waste Area Group 3, Operable Unit 3-14, Field Sampling Plan describes Phase 1 and Phase 2 tank farm soil characterization activities that will be performed as part of the Operable Unit 3-14 remedial investigation of the Idaho Nuclear Technology and Engineering Center (INTEC) tank farm. INTEC is located at the Idaho National Engineering and Environmental Laboratory (INEEL), a government-owned facility managed by the U. S. Department of Energy.

Historically, INTEC served as a nuclear fuel reprocessing facility, a research facility, and a facility for storage of spent nuclear fuel. Liquid waste generated from the reprocessing activities was stored in the tank farm, which consists of 11 underground stainless-steel tanks (300,000-gal each), each contained within a vault, and four underground inactive tanks (30,000-gal each) resting on concrete pads. Currently, INTEC manages the treatment and storage of solidified (calcined) high-level waste generated during past spent nuclear fuel reprocessing and also low-level waste generated from past and ongoing operations and cleanup activities at the INEEL.

The tank farm soil has been contaminated by radioactive liquids due to spills and pipeline leaks from plant and transfer operations. Several known radioactive contamination areas exist at varying locations and depths throughout the tank farm subsurface. No evidence has been found to indicate that any of the tanks themselves have leaked. Characterization of the tank farm soil will take place in two phases, as detailed in this Field Sampling Plan.

The purpose of the Phase 1 field investigation is to define the extent and distribution of radionuclide, organic, and inorganic chemical contamination in the subsurface for known release sites. Subsurface radiation logging will be conducted in several existing and all new probeholes. New probeholes will be installed and surveyed for gamma radiation at sites Chemical Processing Plant (CPP) -15 and CPP-79 Deep. Locations for new probeholes have been proposed using best judgment based on the locations of known release sites, data gaps in the extent and distribution of contamination at those sites, and surface and subsurface infrastructure that may preclude installing probes at some locations. The subsurface gamma radiation surveys will be used to produce log plots showing variations in gamma-ray flux at depth. Correlation between log plots will be used as a basis to estimate the combined horizontal and vertical extent of soil contamination zones. Additionally, several existing probeholes will be re-logged to establish a correlation between gamma readings obtained using past and current logging instruments.

Phase 2 of the characterization effort will involve collecting and analyzing soil samples for specified contaminants of potential concern. Soil samples will be collected at release sites CPP-15, CPP-27, CPP-28, CPP-31, and CPP-79 Deep. Phase 2 corehole locations are identified for CPP-27, CPP-28, and CPP-31 based on past investigations, while specific sample locations for CPP-15 and CPP-79 Deep will be determined based on results of the Phase 1 subsurface gamma radiation survey.

Draft Sampling and Analysis Plan tables for the Phase 2 sampling are provided in an appendix of this Field Sampling Plan. Final Sampling and Analysis Plan tables will be provided as a revision to this Field Sampling Plan, after completion of the Phase 1 gamma logging.

CONTENTS

FIGURES

TABLES

ACRONYMS

ALARA	as low as reasonably achievable
BBWI	Bechtel BWXT Idaho, LLC
COC	chain of custody
COPC	contaminant of potential concern
CPP	Chemical Processing Plant (ICPP)
Cs	cesium
DOT	U.S. Department of Transportation
DQO	data quality objective
EPA	Environmental Protection Agency
ER	environmental restoration
FSP	Field Sampling Plan
FTL	field team leader
HASP	Health and Safety Plan
HDR	Hydrogeologic Data Repository
ICPP	Idaho Chemical Processing Plant
ID	inside diameter
IDW	investigation-derived waste
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
MCP	management control procedure
OD	outside diameter
OU	operable unit
PPE	personal protective equipment
QA	quality assurance
QAPjP	Quality Assurance Project Plan

QC	quality control
RadCon	Radiological Control
RCT	radiological control technician
RI/FS	remedial investigation/feasibility study
RWP	radiological work permit
SAP	Sampling and Analysis Plan
SVOC	semivolatile organic compound
TCLP	toxicity characteristic leaching procedure
VOC	volatile organic compound
WAG	waste area group

Tank Farm Soil and Groundwater Field Sampling Plan for the Operable Unit 3-14 Remedial Investigation/Feasibility Study

1. INTRODUCTION

This Waste Area Group (WAG) 3, Operable Unit (OU) 3-14 Field Sampling Plan (FSP) describes the Phase 1 and 2 tank farm soil characterization investigation activities that will be performed in support of the *Operable Unit 3-14 Tank Farm Soil and Groundwater Remedial Investigation/Feasibility Study Work Plan* (DOE-ID 2004a). This FSP also describes the details, processes, and programs that will be used to ensure that the data generated are suitable for their intended uses. In accordance with the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991), this FSP is one part of a two-part Sampling and Analysis Plan (SAP). The second part of the SAP is a Quality Assurance Project Plan (QAPjP). The governing QAPjP for this sampling effort is the *Quality Assurance Project Plan for WAGs 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning* (DOE-ID 2004b). The field sampling activities also will be conducted in accordance with the "Project Execution Plan for the Balance of INEEL Cleanup Project" (PLN-694), which, along with the QAPjP, establishes the quality requirements for activities within the Idaho National Engineering and Environmental Laboratory (INEEL) concerning the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

These plans have been prepared pursuant to the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300), and guidance from the U.S. Environmental Protection Agency (EPA) for the preparation of SAPs (EPA 1988).

The technical approach document (in preparation) will describe all procedures and equipment required to implement the FSP that are not contained in the work plan or this FSP or other supporting documents. The technical approach document will include engineering calculations, designs, and procedures for safety assessments, sample handling, gamma logging, and other required field investigation elements.

1.1 Purpose and Objectives

The purposes of this FSP are (a) to guide the collection of environmental data in order to fully characterize the extent, distribution, and composition of contamination in soils located at identified release sites at the Idaho Nuclear Technology and Engineering Center (INTEC) tank farm and (b) to support the selection of a remedial alternative. A map indicating locations of the INTEC at the INEEL, and the tank farm within the INTEC, is provided in Figure 1-1.

This investigation involves a two-phased approach to focus project resources on maximizing information gained in the field to define radiological hot spots while minimizing unnecessary sampling and characterization efforts. The overall objective of this field characterization is to provide technical data to support the Baseline Risk Assessment and feasibility study phases of the OU 3-14 Remedial Investigation/Feasibility Study (RI/FS).

The objectives of the Phase 1 field effort are as follows:

- Define the spatial extent and distribution of contaminants of potential concern (COPCs) at known release sites at concentrations above preliminary remediation goals (PRGs) for direct exposure to

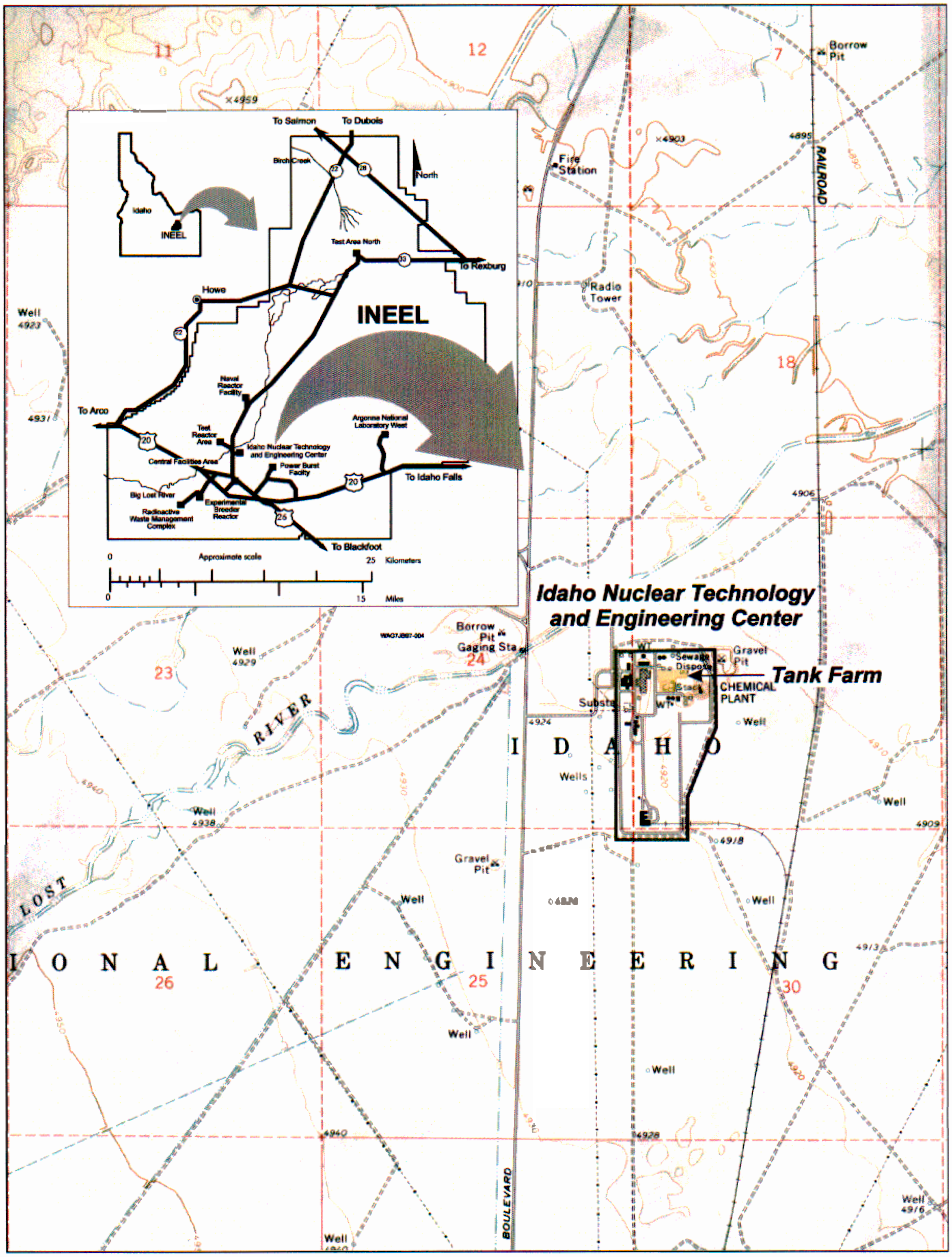


Figure 1-1. Map of the Idaho Nuclear Technology and Engineering Center at the Idaho National Engineering and Environmental Laboratory, showing the tank farm (topography adapted from United States Geological Survey [USGS] Circular Butte 3SW, contour interval 10 ft, scale 1:24000).

soils. All tank farm releases are known to have contained high concentrations of gamma-emitting radionuclides including cesium-137 (Cs-137); therefore, the Phase 1 investigation will focus on determining the spatial extent and distribution (e.g., locations of hot spots) of gamma-emitting radionuclides in the release zones. Gamma radiation will then serve as an indicator of zones where other COPCs are most likely to have been released.

- Identify locations where soil samples will be collected during Phase 2 field activities based on the spatial extent and distribution of COPCs.

The objective of the Phase 2 field effort is to define the composition of radiological contamination from release locations defined during the Phase 1 field effort, from ground surface to basalt.

The tank farm soil has been contaminated by radioactive liquids from past spills and pipeline leaks from plant and transfer operations. In addition to several known highly contaminated areas, low levels of contamination are suspected to exist at varying locations and depths throughout the tank farm subsurface. Contaminant type, concentration, and extent of known spill volumes are incompletely characterized for some spill locations. According to the *Final Record of Decision, Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13* (DOE-ID 1999), the principal threats posed by contaminated tank farm soil are external radiation exposure and contamination of underlying perched groundwater and the Snake River Plain Aquifer.

The tank farm soil is defined as alluvium from the surface down to the top of the uppermost basalt flow. The tank farm soil sites were consolidated into Chemical Processing Plant (CPP)-96. CPP-96 includes release sites CPP-15, CPP-16, CPP-20, CPP-24, CPP-25, CPP-26, CPP-27, CPP-28, CPP-30, CPP-31, CPP-32E, CPP-32W, CPP-33, CPP-58, and CPP-79 (CPP-79 Shallow, CPP-79 Deep). The site map located in Appendix A illustrates the tank farm release sites.

1.2 Health and Safety Plan

The *Tank Farm Soil and Groundwater Health and Safety Plan for the Phase 1 Operable Unit 3-14 Remedial Investigation/Feasibility Study* (INEEL 2004a) is the governing Health and Safety Plan (HASP) for this FSP. The HASP will be amended, as appropriate, through a document action request (DAR) before the commencement of any field activities.

1.3 Project Organization and Responsibilities

The project organizational structure reflects the personnel resources and expertise required for the completion of work activities discussed in this FSP, while concurrently achieving minimization of risks to worker health and safety. The organizational structure presented in the OU 3-14 HASP, Section 9, Figure 9-1 (INEEL 2004a), is current as of the time of writing this FSP and will be updated as required. Shown in Figure 9-1 are job titles, responsibility delineation, and communication chains for personnel who will be filling key roles at the work site.

2. SITE DESCRIPTION AND BACKGROUND

A current, detailed description of the site background of the INTEC tank farm and a detailed account of the source, nature, and extent of contamination present at specific release sites at the INTEC tank farm are provided in Section 3 of the *Operable Unit 3-14 Tank Farm Soil and Groundwater Remedial Investigation/Feasibility Study Work Plan* (DOE-ID 2004a). The investigation logic for known release sites is also included in the work plan.

3. FIELD SAMPLING PLAN OBJECTIVES

This FSP focuses on obtaining data that will address issues pertaining to tank farm soil contamination and is based on findings documented in the OU 3-13 RI/FS report (DOE-ID 1997). These guiding documents specify the need to assess the potential for groundwater contamination originating from contaminated soil within the tank farm fence. This FSP requires the following data collection and analysis efforts to resolve Baseline Risk Assessment and feasibility study data gaps identified in the OU 3-14 RI/FS work plan (DOE-ID 2004a):

- **Phase 1**
  - **Subsurface Gamma Radiation Survey**: Determine the extent and distribution of subsurface gamma radionuclide contamination within the release sites of the tank farm soil investigation area, using both existing probeholes and new probeholes to be installed at proposed locations for release sites CPP-15 and CPP-79 Deep.
- **Phase 2**
  - **Direct-Push Soil Sampling:** Determine the composition of contaminants at sites CPP-15, CPP-27, CPP-28, CPP-31, and CPP-79 Deep by collecting soil samples through the alluvium down to the top of basalt using direct-push technology. All Phase 2 coreholes will be gamma logged after samples are collected for in situ gamma calibration.

This FSP addresses data needs developed using the EPA Data Quality Objectives (DQO) process. The principal study questions (PSQs) pursuant to OU 3-14 tank farm soil DQOs are discussed in Section 5.2 of the OU 3-14 RI/FS work plan (DOE-ID 2004a). Two separate field activity phases are planned to fully address the PSQs. Phase 1 activities will provide information on the spatial extent and distribution of gamma radionuclide contamination within the tank farm soil release sites using subsurface gamma-ray detection methods. Phase 2 activities will define the composition of contaminants down through the alluvium to the top of basalt. This two-phased approach is recommended for most efficiently allocating resources and resolving data needs.

3.1 Data Needs

Specific data needs for sampling activities were developed using the DQO process as discussed in Section 5 of the work plan (DOE-ID 2004a). Phase 1 sampling will focus on detecting and mapping the subsurface distribution of gamma-ray-emitting radionuclides at known release sites in the tank farm soil. Phase 2 will focus on identifying the composition of contaminants at locations identified during the Phase 1 investigation. Cs-137 soil contamination is expected to be the principal source of the mapped radiation fields, as it has been found in all contamination zones discovered in the tank farm to date. It is a universal constituent of processed waste streams in past and present tank farm operations, and it is easily detected at low concentrations (<10 pCi/g). Anomalous gamma radiation areas, most likely associated with Cs-137 contamination, will then serve as an indicator of contamination zones where other analytes of concern are most likely to occur.

3.2 Sampling Methods

Phase 1 downhole in situ radiation measurements will be used to detect gamma-ray emitters. Cs-137 will be the predominant gamma-ray emitter and will serve as an indicator to direct Phase 2 sampling for additional analytes of concern in specific areas of interest.

The planned subsurface small diameter logging system will consist of a gamma-ray sonde that is capable of detecting the 662 keV gamma ray emitted by Cs-137 through steel casing to a minimum detection level of 3 pCi/g. This system and its capabilities are discussed in detail in Section 5.1 of this FSP.

Phase 2 soil sampling will be completed using direct-push technology as outlined in Section 4.54 of this FSP.

3.3 Quality Assurance Objectives

The *Quality Assurance Project Plan for WAGs 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning* (DOE-ID 2004b), referred to as the QAPjP, pertains to quality assurance (QA) and quality control (QC) for all environmental, geotechnical, geophysical, and radiological testing, analysis, and data review. Specific requirements to support the OU 3-14 field investigation, including QA/QC requirements for all sample and analyte types that may potentially be collected, are discussed below.

3.3.1 Project Quality Objectives

The QA objectives specify which measurements must be obtained to produce acceptable data for a project. The technical and statistical qualities of these measurements must be properly documented. Precision, accuracy, and completeness are quantitative parameters that must be specified for physical or chemical measurements. Representativeness and comparability are qualitative parameters.

The QA objectives for this project will be met through a combination of field and laboratory checks. Field checks will consist of collecting field duplicates and equipment blanks as appropriate. Laboratory checks consist of initial and continuing calibration samples, laboratory control samples, matrix spikes, and matrix spike duplicates. Laboratory QA is detailed in the QAPjP (DOE-ID 2004b).

3.3.2 Precision

Field precision is a measure of the variability not caused by laboratory or analytical methods. The three types of field variability or heterogeneity are spatially within a data population, between individual samples and within an individual sample. Though the heterogeneity between and within samples can be evaluated using duplicate samples or sample splits as appropriate, overall field precision will be calculated as the relative percent difference (RPD) between two measurements, or the relative standard deviation (RSD) between three or more measurements as appropriate. The RPD or RSD will be calculated as indicated in the QAPjP (DOE-ID 2004b) for duplicate samples during the data validation process. Precision goals are established for organic and inorganic Contract Laboratory Program (CLP) methods and for radioanalytical analyses in the QAPjP.

3.3.3 Accuracy

Accuracy of field instrumentation can be maintained by calibrating all instruments used to collect data and cross checking with other independently collected data. Accuracy goals are established for organic and inorganic Contract Laboratory Program (CLP) methods and for radioanalytical analyses in the QAPjP (DOE-ID 2004b).

3.3.4 Completeness

Overall completeness of the data collection effort is assessed by comparing the number of samples collected and analyzed to the number of samples planned (DOE-ID 2004b). Field completeness compares the number of samples collected to the number of samples received at the analytical laboratory, while analytical completeness compares the number of samples received to the number of analyses performed. Field sampling completeness is affected by factors such as equipment and instrument malfunctions and insufficient sample recovery. Analytical completeness is affected if (a) samples are not analyzed within the defined holding time, (b) a sample is damaged during handling or storage, or (c) the laboratory data cannot be validated and the sample cannot be reanalyzed.

Critical Phase 1 and 2 sample locations are those identified in Section 4 (Figures 4-1, 4-2, 4-4, and 4-5). Critical samples are defined as those required to achieve project objectives or to set limits on decision errors (e.g., samples to assess compliance with a cleanup level), while non-critical samples are those required for secondary or supporting information (e.g., provide indications of trends over time).

Every critical Phase 1 probehole and Phase 2 corehole and every Phase 1 gamma logging or Phase 2 sampling interval will be completed to the extent technically and administratively feasible and within the project schedule. If a probehole or corehole cannot be installed at a specified location due to infrastructure constraints, or alternatively, at a nearby location that will still address the data gaps to be resolved by the original probehole as determined by the field team leader (FTL), then an alternate location will be identified or the location will be deleted. Alternate locations will be identified and cleared with INTEC facility operations personnel before mobilization, where possible. Designated Agency interfaces will be contacted and consulted before deleting a location, if concurrence can be reached with minimal equipment and operator downtime, e.g., less than 1 hour.

Additionally, if a Phase 2 sampling interval cannot be collected due to gamma radiation readings exceeding allowable levels established in the technical approach document, then the FTL will document the decision and the rationale for not collecting the samples.

3.3.5 Representativeness

Representativeness is evaluated by assessing the accuracy and precision of the sampling program and expressing the degree to which samples represent actual site conditions. In essence, representativeness is a qualitative parameter that addresses whether the sampling program was properly designed to meet the DQOs. The representativeness criterion is best satisfied by confirming that sampling locations are properly selected and a sufficient number of samples are collected to meet the requirements stated in the DQOs.

3.3.6 Comparability

Comparability is a qualitative measure of the confidence with which one data set can be compared to another. These data sets include data generated by different laboratories performing the work, data generated by laboratories in previous studies, data generated by the same laboratory over a period of several years, or data obtained using different sampling techniques or analytical protocols. For field aspects of this program, data comparability will be achieved using standard methods of sample collection and handling. Additionally, several existing probeholes that were previously logged using radiological survey equipment will be re-logged using the specified gamma sonde to improve comparability of past and current data.

3.3.7 Field Data Reduction

The reduction of field data is an important task to ensure that errors in sample labeling and documentation have not been made. This includes cross-referencing the SAP table provided in Appendix B of this FSP with sample labels, logbooks, and chain-of-custody (COC) forms. Prior to sample shipment to the laboratory, field personnel will ensure that all information is properly documented.

3.3.8 Data Validation

All laboratory-generated data will be validated to Level A. Data validation will be performed in accordance with GDE-7003, "Levels of Analytical Method Data Validation." Field-generated data (e.g., downhole gamma readings and water levels) will be validated through the use of properly calibrated instrumentation, comparing and cross checking data with independently gathered data, and recording data collection activities in a bound field logbook.

3.3.9 Quality Assurance Objectives for Measurement

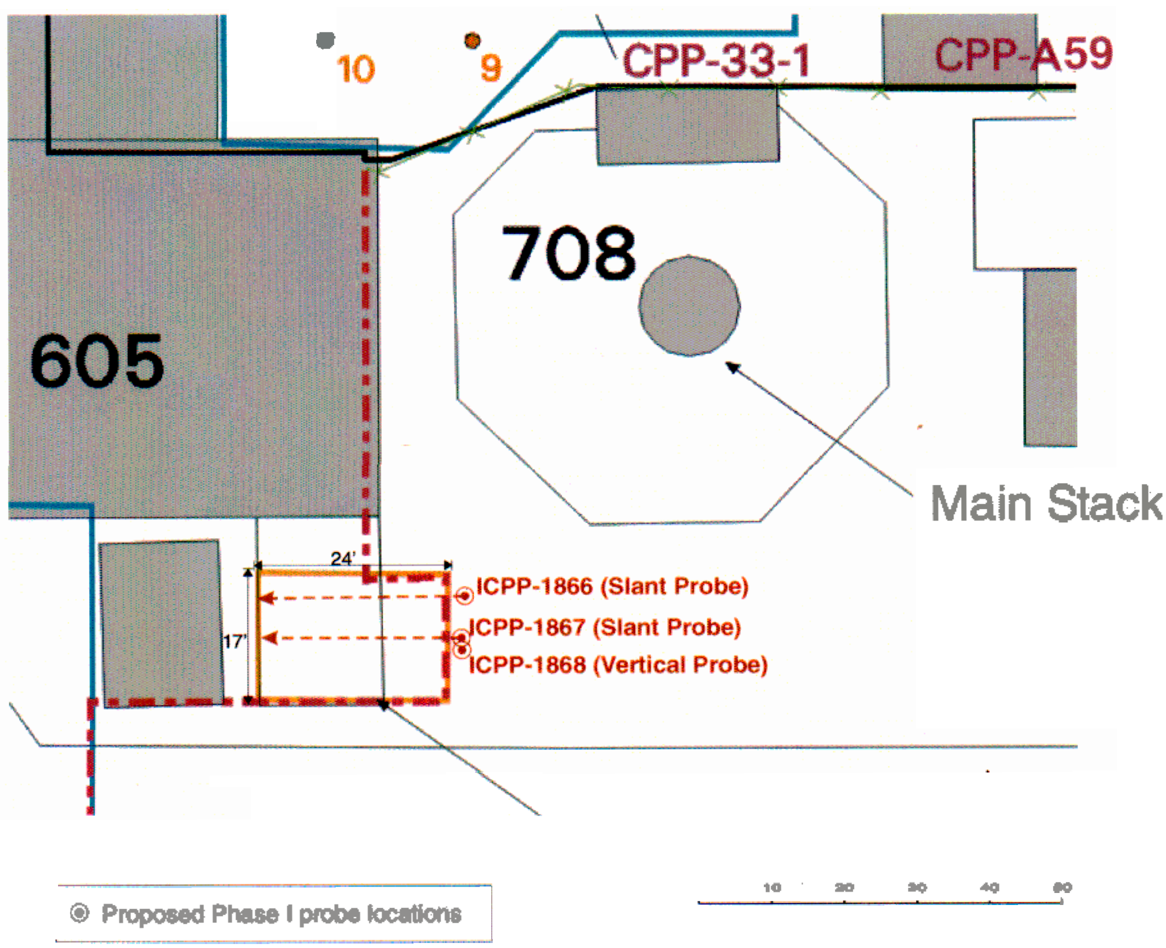
The QA objectives are specifications that the monitoring and sampling measurements identified in the QAPjP must meet to produce acceptable data for the project. The technical and statistical quality of these measurements must be properly documented. Precision, accuracy, method detection limits, and completeness must be specified for hydraulic and chemical measurements. Specific QA objectives are specified in the QAPjP (DOE-ID 2004b).

4. CHARACTERIZATION METHODS

This section discusses the field methods designed for completion of the Phase 1 downhole gamma logging, Phase 1 pre-drilling using the vacuum excavator and/or hand augering, Phase 1 direct-push drilling, Phase 1 hand augering, and Phase 2 soil sampling.

4.1 Phase 1 Downhole Radiation Logging

The subsurface gamma-ray survey will be performed within existing probeholes A53-11 and A53-19 (see map in Appendix A) from ground surface to total depth, in new probehole locations to be installed at sites CPP-15 and CPP-79 Deep (Figures 4-1 and 4-2, respectively), and in the Phase 2 coreholes at CPP-15, -27, -28, -31, and -79 after the sample cores have been removed. Locations for new probeholes have been proposed based on the locations of known release sites, information regarding whether the extent and distribution of radionuclide contamination were previously determined for that release site, and infrastructure constraints. Probeholes installed at or near the specified locations should help to adequately resolve DQO Decision Statements 1 through 3. The Phase 1 investigation strategy for each site required to resolve each decision statement is described for each site in the Field Investigation Summary tables provided in Appendix D of the work plan and is summarized below in Table 4-1.



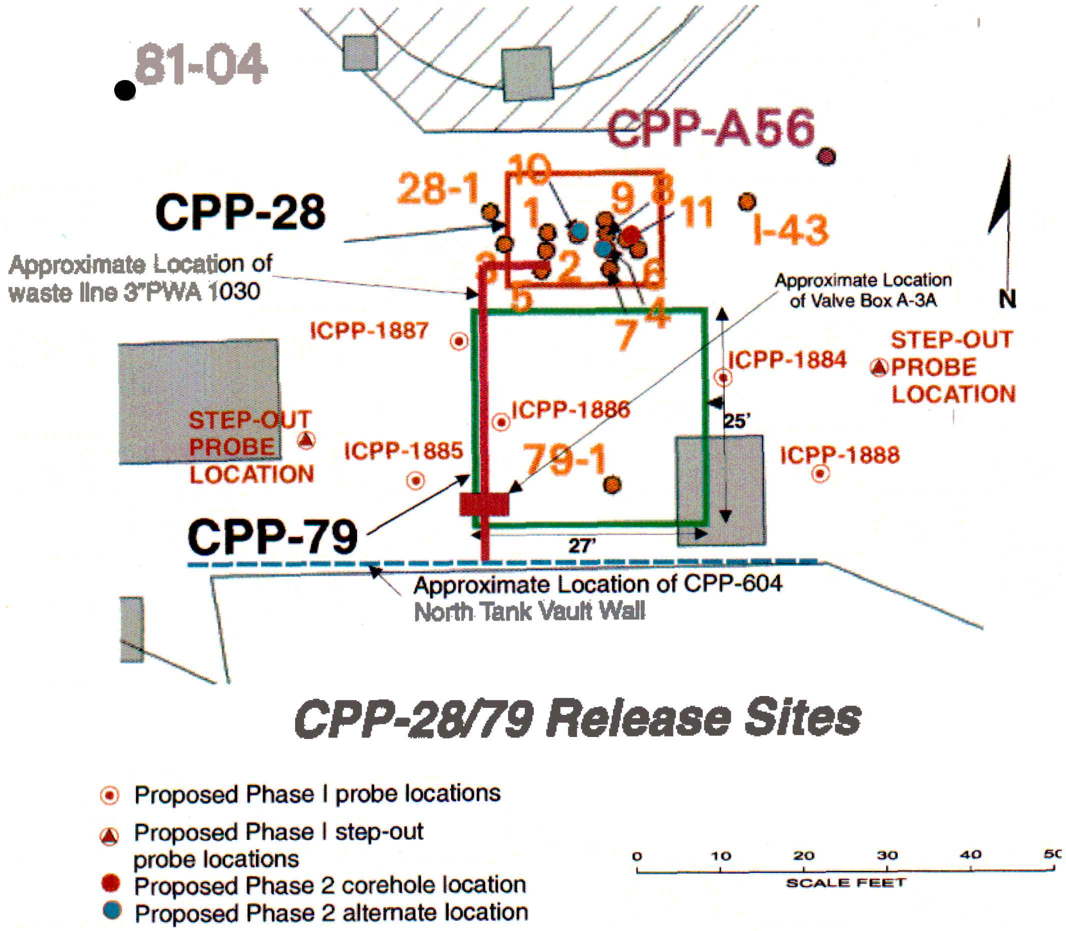


Figure 4-2. Proposed locations for Phase 1 probeholes at release site CPP-79 Deep and Phase 2 coreholes at Site CPP-28.

Table 4-1. Location and investigation strategy of proposed Phase 1 probeholes.

Release Site	HDR Name	Depth	Tooling	Investigation Strategy
CPP-15	ICPP-1866 ICPP-1867 ICPP-1868	Angle-pushed to 20 ft bgs Vertically pushed to basalt Angle-pushed to 20 ft bgs	Vacuum lance or hand auger/direct push	Establish maximum depth, areal extent, and distribution of contamination. Angle-pushing will attempt to intercept contamination 20 ft bgs beneath previous sampling location CPP-15-4-D.
CPP-79 Deep	ICPP-1884 ICPP-1885 ICPP-1886 ICPP-1887 ICPP-1888	Vertically pushed to basalt Vertically pushed to basalt Vertically pushed to basalt Vertically pushed to basalt Vertically pushed to basalt	Vacuum lance or hand auger/direct push	Establish maximum depth, areal extent, distribution and source of contamination.

bgs = below ground surface
CPP = Chemical Processing Plant (former name for INTEC)
ICPP = Idaho Chemical Processing Plant (former name for INTEC)
HDR = Hydrogeologic Data Repository

The three probeholes proposed for the CPP-15 release site shown in Figure 4-1 are positioned to determine the areal and vertical extent of contamination. Probehole locations are constrained by the presence of infrastructure (Building CPP-605, the concrete slab just south of it, and the structure on the slab). Probeholes ICPP-1866 and -1867 will be angle-pushed from the east end of the concrete slab, with the objective of intercepting contamination potentially present about 20 ft below ground surface (bgs) at the previous sampling location, CPP-15-4-D, where anomalously high concentrations of radionuclides were detected at about 10.5 ft bgs. These probeholes will be used to establish the vertical extent and distribution of contamination. Probehole ICPP-1868 will be pushed vertically at the east end of the concrete slab, with the objective of bounding the eastern areal extent and the vertical extent and distribution of contamination. Probehole ICPP-1868 will be pushed to basalt, while probeholes ICPP-1866 and -1867 will not be pushed deeper than 20 to 25 ft bgs.

If significant contamination, e.g., greater than 1% of that observed at the hot spot, is detected in the proposed probeholes, then supplemental probeholes may be installed outward from the originally planned probeholes in an effort to delineate the extent of contamination. Probeholes will be installed and gamma logged at these step-out locations in the event that the defined locations do not adequately define the extent of contamination, e.g., the defined locations show contamination greater than 1% of that observed at the hot spot. Supplemental probehole locations will be based on infrastructure constraints, the degree of contamination indicated by the gamma logging, and the apparent geometry of the contamination. If gamma logging of the "step-out" probeholes shows contamination above this level, then another probehole should be pushed along roughly the same radial line originating from the estimated release location. The spacing should be no more than about $2^{1/2}$ or 1.4× the radial distance from the hot spot of the previous probehole, within the constraints of infrastructure, because each 1.4× increase in radius will double the estimate of the contaminated soil volume and thereby the source term estimate, assuming a cylindrical geometry for the volume of contaminated soil. The process should be repeated until the extent of contamination above about 1% of the hot spot gamma level, but not less than the tank farm background gamma level, is bounded on all sides.

The five Phase 1 probeholes at the CPP-79 Deep release site shown in Figure 4-2 are located to define the areal and vertical extent and distribution of the contamination observed at a depth of about 34 ft bgs in previous probehole CPP-79-1 and to test the two conceptual models of the release described in Section 3.1.3.3 of the work plan (DOE-ID 2004a). The original conceptual model attributed the contamination at CPP-79 Deep to the CPP-28 release, with possible migration of contamination along transfer pipe PWA-1030 trench backfill. The revised conceptual model attributes the contamination at CPP-79 Deep to releases from valve box A-3A. Probeholes ICPP-1886 and -1887 will be pushed on the west and east sides, respectively, of PWA-1030 to test the original conceptual model that contamination migrated along pipe trench backfill and to bound the northern extent of contamination. Probehole ICPP-1885 will be pushed north and west of valve box A-3A to test the revised conceptual model and to bound the extent of contamination. Probeholes ICPP-1884 and -1888 will be pushed northeast and east, respectively, of CPP-79-1 to bound the extent of contamination. The potential extent of contamination is bounded on the south by the CPP-604 tank vault. All probeholes will be pushed to basalt.

Two proposed step-out probehole locations for CPP-79 are shown in Figure 4-2. The western step-out probehole will be installed if significant contamination is observed in probeholes ICPP-1885 and/or -1887, and the eastern step-out probehole will be installed if significant contamination is observed in ICPP-1884 and/or -1888.

Possible probehole locations at both CPP-15 and -79 are constrained by infrastructure, both aboveground and belowground. Proposed locations have been selected to avoid known infrastructure. More detailed as-built drawings and facility personnel input will be used to select final probehole locations. These locations may be modified and/or new locations added during installation based on information gained while in the field. Probehole locations for both CPP-15 and CPP-79 Deep could be moved several feet in any direction and would still provide the required information.

The subsurface gamma-ray logging procedure is described in Section 5.1. The gamma-logging instrument will be calibrated to provide soil concentrations of Cs-137 by gamma logging one or more Phase 2 coreholes after samples have been collected and analyzed by gamma spectrometry for specific gamma-emitting radionuclides. The Phase 1 gamma-logging readings in counts per second will then be correlated to concentrations in pCi/g by sampling interval.

The method detection level (MDL) for field screening measurements of Cs-137 gross gamma using the small-diameter logging system identified for this project is estimated to be on the order of 3 pCi/g. This MDL is based on the following assumptions:

- Gross gamma count time of 10 seconds per depth interval (generally 0.5-ft)
- Steel casing wall thickness of 0.31-in.

Precision, accuracy, and reliability information for the selected gamma detector will be provided in the technical approach document (in preparation). The technical approach document will describe the procedures and equipment required to implement the FSP.

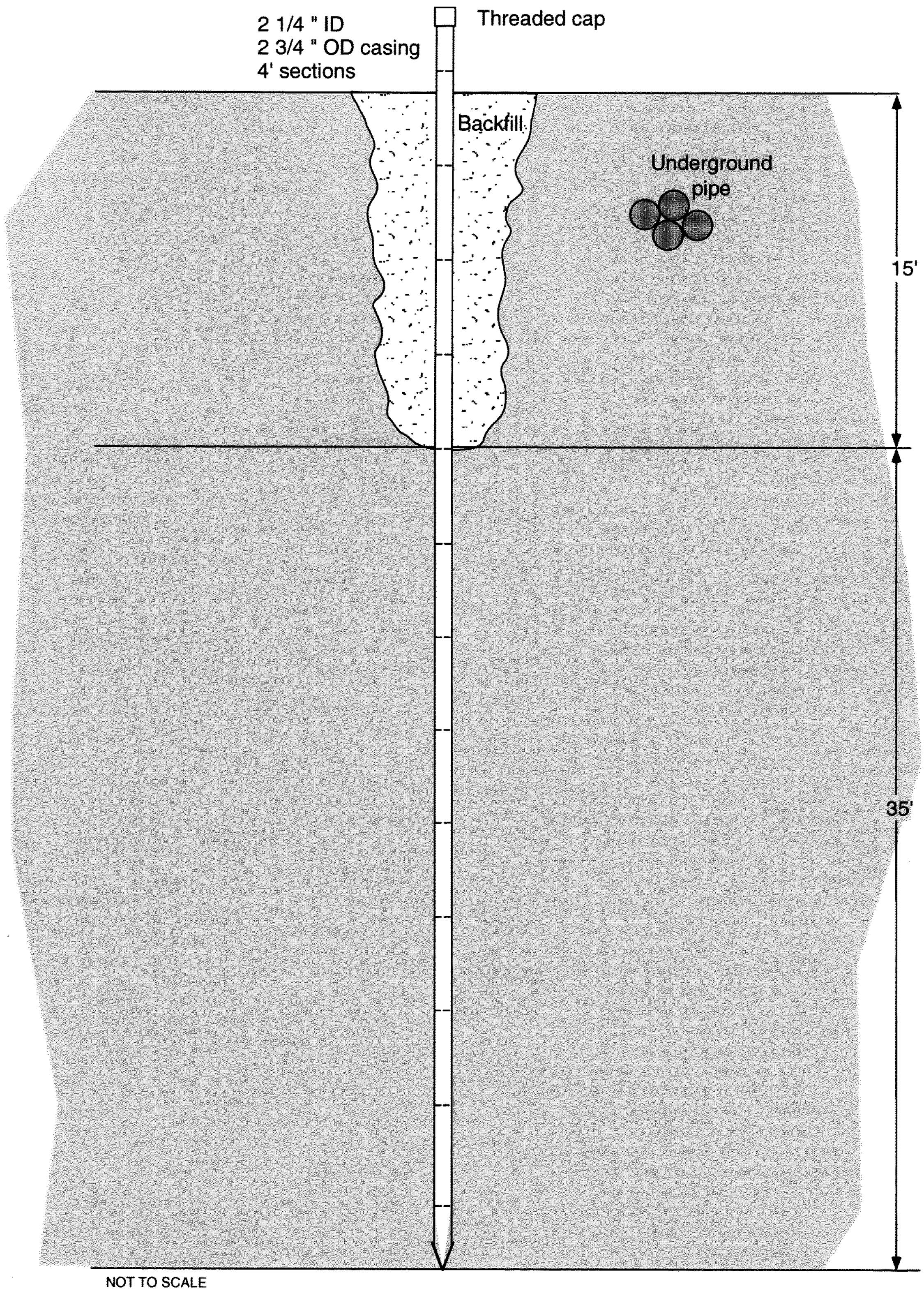
This method detects gamma-emitting radionuclides only. Non-gamma emitters are not detected by this method.

4.2 Phase 1 Pre-Drilling Using the Vacuum Excavator and/or Hand Augering

New probeholes will be installed at sites CPP-15 and CPP-79 Deep (see Table 4-1 and Figures 4-1 and 4-2). The presence of buried pipes, valve boxes, and other infrastructure elements associated with past and present tank farm operations creates a substantial hazard for any invasive activities within the tank farm soil. If an infrastructure feature was struck by drilling or excavation equipment, a contaminant release could occur. Since the tank farm infrastructure occurs almost exclusively within the depth interval from 0 to 12 ft, probe and/or instrument installation through the upper soil zone may be accomplished using a vacuum excavation system to prevent damage to the infrastructure. If the vacuum excavation technique proves impractical, then pilot borings may be completed using a hand auger.

Vacuum excavation technology involves the use of a high-pressure jet of air, directed by a nozzle called an air lance, to penetrate, expand, and break up soil. Soil material, including rock and debris, is removed by a 4-in.-diameter vacuum hose to a drum or similar receptacle (anticipated to be 35- or 55-gal drum). This process is a closed-loop system, thereby reducing the risk of an air release. Vacuum excavation advances the probehole without damaging underground pipelines or utilities.

The vacuum excavator may be used to excavate a pilot hole 3 to 5 in. in diameter to a depth of 15 ft bgs. A schematic of the probehole installation is shown in Figure 4-3. If subsurface piping or other infrastructure is encountered, the probehole location will be abandoned in favor of a new location at a nearby position, unless the probehole casing can be placed safely adjacent to the obstacle. Soil will be excavated in 5-ft increments (0 to 5 ft, 5 to 10 ft, 10 to 15 ft) and stored temporarily in drums labeled according to hole position and depth range. If the vacuum-lanced boring will not stay open, Schedule 40 polyvinyl chloride casing may be inserted to maintain an open hole temporarily until the direct-push tool is installed.



BASALT

Figure 4-3. Schematic of probehole installation. (Casing dimensions are preliminary and will be defined in the technical approach document [in preparation]).

Pilot holes will extend from the ground surface to approximately 15 ft bgs to safely penetrate through soil and avoid tank farm piping or other obstructions associated with past and present tank farm operations. Prior to any excavation, the proposed locations will be surveyed, staked, pre-approved by management, and verified based on drawings and historical documentation. The material will be screened for radiological contamination with a hand-held beta/gamma detector and will be drummed and stored as investigation-derived waste (IDW) by the INTEC environmental coordinator or WAG personnel assigned to the project.

Since the vacuum excavator will be using air to remove soil from the probehole, cross contamination between probeholes should not be of concern relative to the nature of the measurements (downhole gamma-ray survey) being made in the completed probeholes. The amount of contamination that can be carried from the vacuum hose and air lance should be negligible relative to the volume of soil being removed. Furthermore, plans for the probehole investigation are to generally proceed from the least contaminated areas to the most contaminated areas. If extensive contamination is identified in the air lance and associated hosing, the contaminated equipment will be discarded and new equipment used. If hand augering is used instead of vacuuming, decontamination procedures will be described in the technical approach document.

After successful completion of pilot holes, steel probehole casing will be installed to the bottom of the hole as outlined in Section 4.3. This procedure will permit probehole casings to be installed with minimal void space for a more accurate gamma reading of that specific location. After the probehole has been gamma logged, any void space at the surface between the soil and the probe casing will be backfilled with clean silica sand. Probe construction techniques will be selected after the development of technical and functional requirements for this activity.

Vacuum excavation or hand augering may alter the soil media characteristics within the immediate vicinity of the probehole. The entire length of the probehole will be logged, and the data obtained will be reviewed in an effort to determine if the vacuum excavation or hand augering of the upper 15 ft of the probehole has an effect on the gamma-logging results. In particular, gamma-logging data will be carefully reviewed at the 15-ft depth to see if any abrupt changes in the gamma-logging results are observable in the vicinity of the transition between the section of the probehole that was created by vacuum excavation or hand auguring and the section of the probehole created solely by direct push. Because the gamma logging is to be used as a qualitative indicator of the presence of releases of material to the soil (quantitative measures of contamination will be obtained from analyses of soil samples obtained by coring), minor disturbances of the soil immediately adjacent to the steel probe casing have a noticeable effect on the gamma-logging results. High levels of gamma activity in the upper 15 ft of a probehole will tend to minimize possible error in the measurements obtained. If, on the other hand, gamma activity in the soil is in the lower range of the minimum detection level for the instrument used, then disturbed soil adjacent to the steel casing might be expected to have a larger effect on the gamma-logging results in the upper 15 ft of the probehole.

4.3 Phase 1 Direct-Push Drilling in Tank Farm Soil

Several manufacturers produce a direct-push system capable of installing a steel probe to a depth of approximately 50 ft, which is the anticipated average depth to basalt at the tank farm. These systems use a truck-mounted power unit or power-take-off unit to power the hydraulic push system. This system is coupled with a hydraulic hammer to assist in installation by pounding on the casing. This configuration was successfully demonstrated at INTEC in 2001. The technique proved capable of rapidly installing casing to the depth of the basalt/alluvium interface. This procedure complies with the vibration limitations in place at the time of writing for Section 2.4 of "WAG 3 OU 3-14 RI/FS Tank Farm Soil Phase 1 Field

Sampling Plan Probe Installation Technical Approach (Draft)."[a] This method will result in installation of the probehole casings without creating drill cuttings. This method also will allow installation of the casings without the need for containment and excessive personal protective equipment (PPE) requirements.

A direct-push rig will be used in the tank farm to install the additional probeholes for downhole gross gamma logging. The steel drive casing will be attached in 4-ft or 5-ft lengths (depending on the type of tooling used) as the probehole is advanced. The steel casing will have a minimum inside diameter (ID) of 2 1/4-in, or as required for the type of gamma-logging sonde that is used. Upon reaching the basalt or refusal, pushing/hammering will cease and the casing will be detached from the rig at the lowest possible position to maintain an aboveground completion. Exceptions may be made in specific areas determined by tank farm personnel, as some probeholes may be completed at ground surface. The casing will be capped with an all-weather cap to prevent entry of unwanted materials. All probehole locations will be surveyed to establish exact locations.

The direct-push rig will be surveyed by the radiological control technician (RCT) using a hand-held radiation detection monitor (Ludlum 2a or equivalent), and smears will be collected if deemed necessary by the RCT. If no contamination is detected, the rig will be moved to the next probehole location. If contamination is found, removal of the contamination using dry decontamination (or other decontamination methods stipulated by the RCT) will be attempted. When the rig is connected to the next probehole casing, the installation procedure will be repeated.

If a probehole cannot be completed to basalt, written documentation will be provided explaining why moving the probehole location is necessary. If the probehole cannot be completed in the revised location, an entry will be made in the logbook and will serve as formal documentation. The Agencies will be subsequently notified. The casing will not be removed from the tank farm soil because of possible radiation exposure to workers and the environment. Rather, the casing will be capped and left in place.

4.3.1 Direct-Push Equipment

Probehole casings will be installed using direct-push technology. No direct-push or sampling equipment, other than the probehole casing, will come in contact with the soil. Careful use of the equipment will ensure that no releases of contamination occur to the environment, and that all activities will be conducted in accordance with appropriate management control procedures (MCPs). The subcontractor supplying the direct-push equipment will work with INEEL radiological engineers and tank farm facility engineers to carry out the following activities:

- Modify existing subcontractor-owned equipment. INEEL and subcontractor personnel will design and manufacture the necessary equipment to provide radiation protection for personnel working with and around the direct-push equipment. This will include all direct-push and handling tools and equipment to transfer any vacuumed or augered soils from the probehole to the drums.

- Design, modify, or retrofit subcontractor-owned equipment to minimize cuttings. All aspects of this project will keep waste production to a minimum.

- Design, modify, or retrofit subcontractor-owned equipment so that it can be maneuvered to fit within the limited pushing locations while providing maximum working space for personnel.

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a. "WAG 3 OU 3-14 RI/FS Tank Farm Soil Phase 1 Field Sampling Plan Probe Installation Technical Approach (Draft)," INEEL/INT-01-00521, Idaho National Engineering and Environmental Laboratory, May 2001.

- Design platforms or structures for steep berm or ditch locations so that pushing and sampling equipment can accomplish the sampling.

- Design, modify, and manufacture or retrofit subcontractor-owned pushing and sampling equipment to meet the tank farm weight restrictions identified in the "WAG 3 OU 3-14 RI/FS Tank Farm Soil Phase 1 Field Sampling Plan Probe Installation Technical Approach (Draft)."

- Design, modify, and manufacture, or retrofit subcontractor-owned equipment to ensure that no damage occurs to nearby underground structures.

The tank farm engineers will review and approve the position of the direct-push rig and the sampling location before any sampling activities begin. Some of the pushing locations are on steep banks and may require the design and manufacture of pushing platforms that will support the direct-push rig during pushing operations. The platform design and final assembly will be reviewed, inspected, and approved by the recognized professional engineer or structural engineer, the tank farm engineers, and the appropriate INEEL safety personnel.

4.3.2 Direct-Push Probehole Installation

Probeholes will be installed using a hydraulically powered, direct-push probing rig (e.g., AMS PowerProbe, Geoprobe, Stratoprobe) to advance a minimum 2 1/4-in. ID (2 3/4-in. outside diameter [OD]) hollow probehole casing, or as required for the type of gamma-logging sonde that is used, with a threaded drive point from the land surface to the sediment/basalt interface (see Figure 4-3). This will allow for in situ characterization of radiological contamination as indicated by gross gamma logging. Once the hollow probehole casing has been advanced to the sediment/basalt interface or refusal, the probing rig/vehicle will relocate to another probehole location. Final depths of each probehole will vary based on the depth of the sediment/basalt interface. Soil will be displaced laterally with the direct-push monitoring probehole installation, thus eliminating the accumulation of surface drill cuttings. The probeholes will be logged with an in situ (downhole) radionuclide assay system to detect gamma radiation. Gross gamma results may be used to guide installation of subsequent probeholes. If proposed probehole locations are changed because of information obtained in the field, all required excavation clearances must be obtained prior to commencing the boring. The installation of the probes will proceed as follows:

1. After vacuum excavation or hand augering to 15 ft has been completed (if required) and no subsurface structures have been encountered, a minimum 2 1/4-in ID diameter probehole casing, or as required for the type of gamma-logging sonde that is used, with a threaded drive point will be installed, and direct-push will be advanced until the sediment/basalt interface is encountered. The threaded probehole casing will be advanced in 4- or 5-ft sections, depending on the tooling that is used. Real-time radiological field screening activities will be conducted in the area where the drive casing enters the soil as probing through the surface sediments occurs, and readings with estimated depths will be recorded in the field notes. The purpose of the real-time monitoring is to help ensure control of worker exposure to radioactive materials. If radioactivity is detected at the surface while the probes are being installed, drilling operations will have to be modified as directed by Radiological Control (RadCon).

2. Once the probehole casing has been advanced to the final depth, the drill rig will move off the probe site. If required by the RCT, contamination surveys of push-probe equipment will be performed prior to movement of the vehicle to the next location. Once the rig is approved as clean by the RCT, the rig will be set up at another probing location. All probehole casing threaded-drive points will be left in place to allow access for downhole gamma-radiation logging.

3. Immediately after installation, each probehole will be logged from bottom to top with a small diameter gross gamma sonde system (as outlined in Section 5.1) to screen for gross gamma contamination. Gross gamma results may be used to guide installations of subsequent probeholes.

4.4 Phase 2 Soil Sampling

This section outlines the soil sampling procedure using direct-push equipment, field decontamination procedures, and sample packaging requirements for completion of Phase 2 soil sampling.

4.4.1 Soil Sampling Procedure

Soil samples will be collected as part of the Phase 2 investigation at release sites CPP-15, -27, -28, -31, and -79 Deep to identify the composition of contaminants (Table 4-2). The Phase 2 investigation strategy required to resolve DQO Decision Statements 2 and 3 is described for each site in the Field Investigation Summary tables provided in Appendix D of the work plan and is summarized in Table 4-2. The COPCs to be analyzed are listed in Table 5-1. Analytical methods and laboratory requirements are discussed in Section 5.2.

Potential Phase 2 corehole locations for site CPP-28 are shown in Figure 4-2. Phase 2 corehole locations for CPP-27 and -31 are shown in Figures 4-4 and 4-5, respectively. Specific sample locations and depth intervals for CPP-15 and -79 Deep will be determined upon completion of the Phase 1 investigation based on extent and distribution of radionuclide contamination. Specific sample locations and depth intervals for all Phase 2 sampling locations are provided in SAP tables in Appendix B of this FSP. All sampling locations will be surveyed to establish exact locations.

Phase 2 coreholes will be installed immediately adjacent to probeholes installed during Phase 1 or adjacent to existing probeholes. Installation of pilot holes, as described in Section 4.2, will be minimized to the extent feasible to allow for collecting continuous cores from the ground surface to basalt.

The proposed Phase 2 corehole locations at CPP-28, including two alternate locations, are shown in Figure 4-2. The preferred location at CPP-28, near previous observation well #11, was selected based on the cross section shown in Figure 3-16 of the work plan (DOE-ID 2004a) and is located so that the pilot hole can be installed without bringing highly radioactive soil to the surface, potentially resulting in excessive personnel exposures, while still intercepting high radioactivity intervals at depth with the direct-push equipment for sample collection. Sampling at this location should also avoid collecting or having to push past > 50-R/hr soil intervals, samples from which will likely exceed contact handling exposure limits for both field and laboratory personnel. Samples from these locations should help to adequately resolve DQO Decision Statements 2 and 3. Alternate locations near previous observation wells #4 and #10 similarly meet these criteria.

The proposed Phase 2 corehole location at CPP-31, collocated with the Phase 1 probehole, was similarly selected based on the cross section shown in Figure 3-7 of the work plan (DOE-ID 2004a) and is located so that the pilot hole can be installed without bringing highly radioactive soil to the surface, potentially resulting in excessive personnel exposures, while still intercepting high radioactivity intervals at depth with the direct-push equipment for sample collection. Sampling at this location should also reduce the possibility of producing samples with gamma activity levels that would preclude contact handling. Samples from these locations should help to adequately resolve DQO Decision Statements 2 and 3. An alternate location may be selected based on infrastructure constraints.

Table 4-2. Investigation strategy for release sites requiring Phase 2 soil sampling.

Release Site	HDR Name	Depth	Tooling	Investigation Strategy
CPP-15	TBD	Ground surface to basalt	Direct push with dual-tube sampling system; sample liner lengths < 2 ft	Determine composition of contamination; determine extent of migration in the alluvium of mobile constituents.
CPP-27	TBD	Ground surface to basalt	Direct push with dual-tube sampling system; sample liner lengths < 2 ft	Determine composition of contamination; determine extent of migration in the alluvium of mobile constituents.
CPP-28	TBD	Ground surface to basalt	Direct push with dual-tube sampling system; sample liner lengths < 2 ft	Determine composition of contamination; determine extent of migration in the alluvium of mobile constituents.
CPP-31	ICPP-1874	Ground surface to basalt	Direct push with dual-tube sampling system; sample liner lengths < 2 ft	Determine composition of contamination; determine extent of migration in the alluvium of mobile constituents.
CPP-79 Deep	TBD	Ground surface to basalt	Direct push with dual-tube sampling system; sample liner lengths < 2 ft	Determine composition of contamination; determine extent of migration in the alluvium of mobile constituents.

CPP = Chemical Processing Plant (former name for INTEC)
HDR = Hydrogeologic Data Repository
ICPP = Idaho Chemical Processing Plant (former name for INTEC)
TBD = To be determined

The proposed Phase 2 corehole location at CPP-27 is shown in Figure 4-4. This location was selected to sample anomalous contamination observed in existing probehole CPP-27-1, at a depth of 6 ft bgs. These results will be used to establish a source term for modeling contaminant flux to groundwater for site CPP-27, either by relating the contamination to the known CPP-27 release or by determining a composition for a new source. Samples from this location should help to adequately resolve DQO Decision Statements 2 and 3. An alternate location may be selected based on infrastructure constraints.

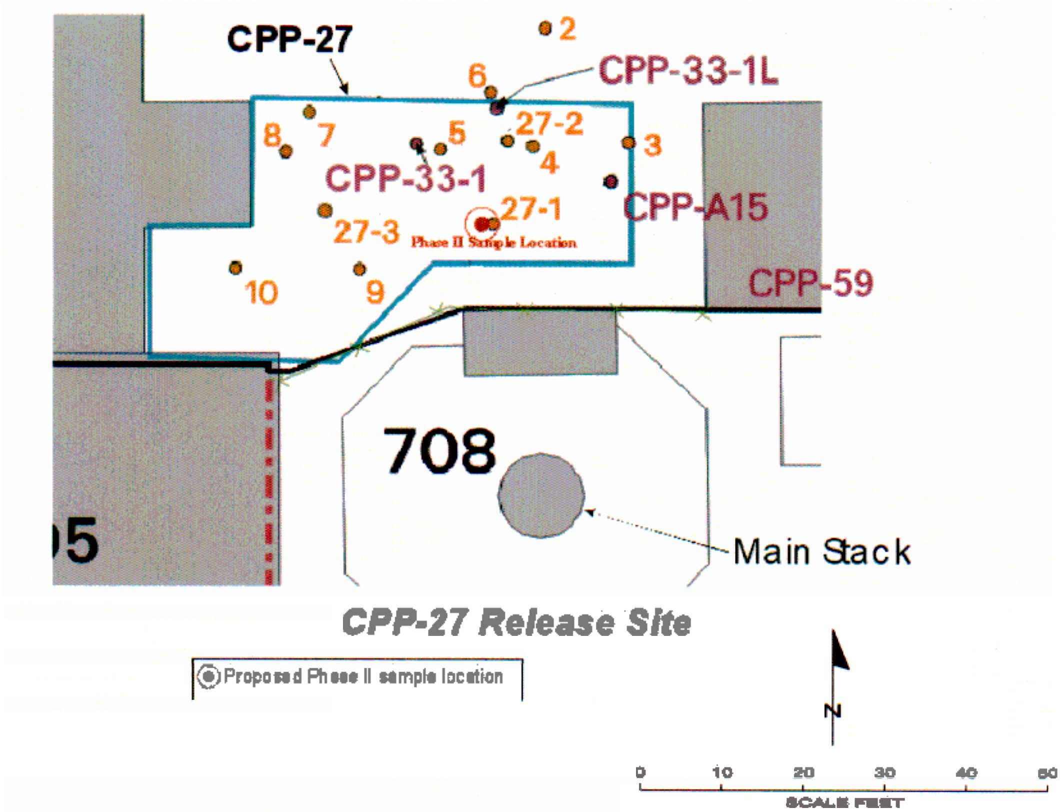


Figure 4-4. Proposed location for Phase 2 corehole at CPP-27.

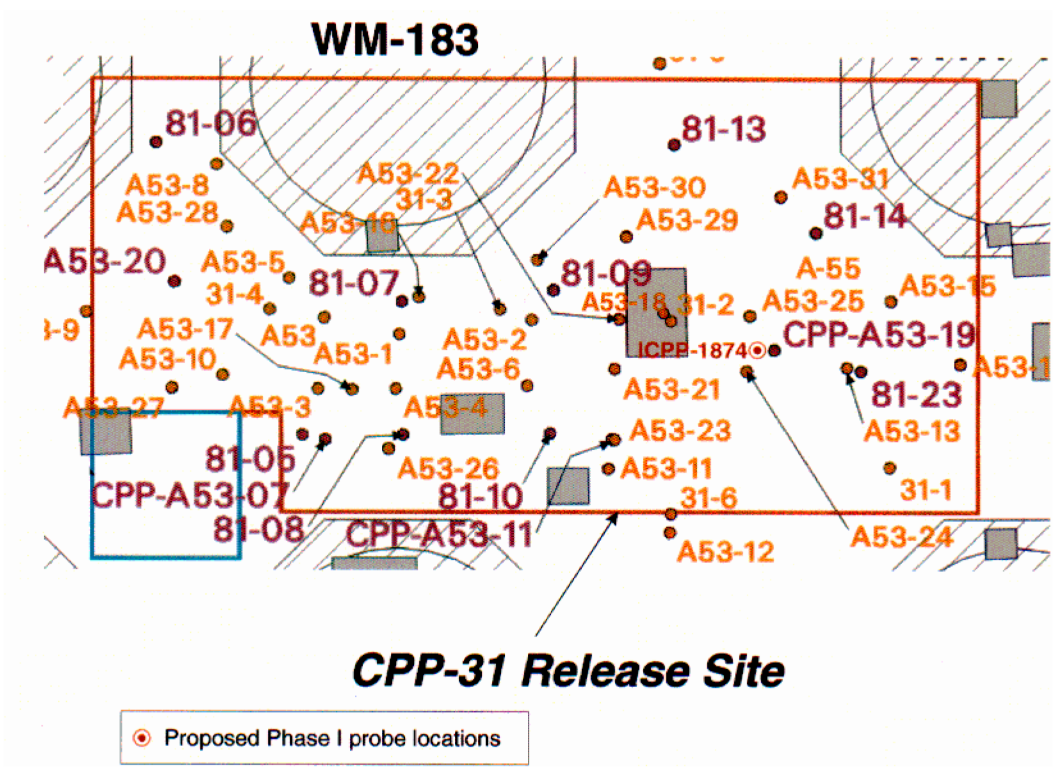


Figure 4-5. Proposed location for Phase 1 probehole and Phase 2 corehole at CPP-31.

The results obtained from the gross gamma logging of the Phase 1 probeholes or from existing in situ probehole gamma readings for sites CPP-27, -28 and -31 will be used to determine the locations at which soil samples can be collected based on gamma activity. Contact-handling limits will be identified in the technical approach document. Soil intervals exceeding contact handling limits will not be sampled. Previous in situ gamma readings determined at CPP-28 and -31, as well as new readings obtained during Phase 1 at all sites, will be used to identify soil intervals exceeding contact handling limits. The direct-push sample liner and drive shoe will be replaced with a solid drive tip seal to push past those intervals exceeding contact handling limits. Sampling will resume at the next soil interval below contact handling limits.

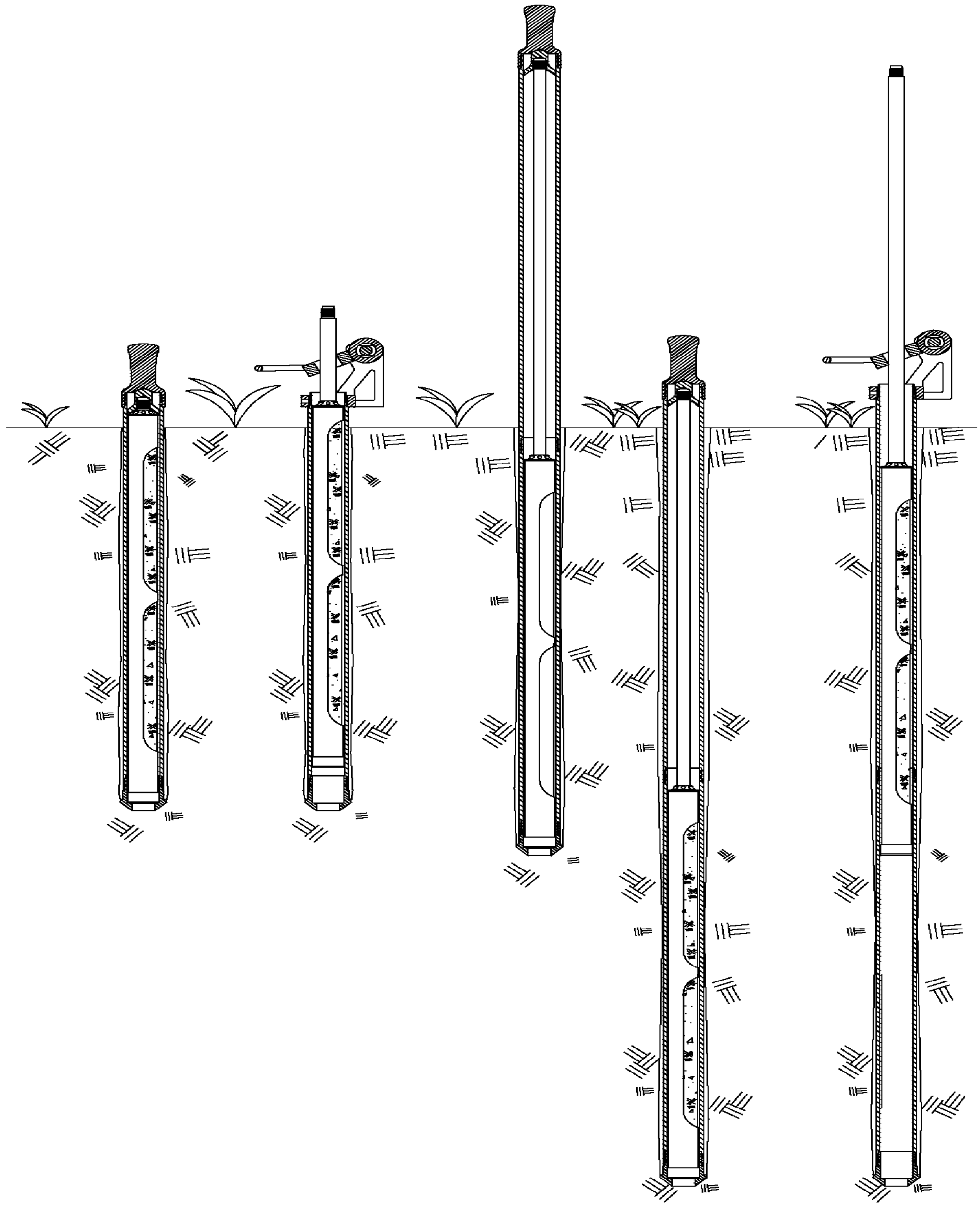
Soil samples will be collected at the specified locations and intervals from the ground surface to basalt unless pilot holes are required, in which case the interval penetrated by the pilot hole will not be sampled. Two 2-ft (maximum length) sample liners will be collected from each 4-ft soil interval and gamma surveyed. The higher activity core will be subsampled for analysis if it is within contact-handling limits. The lower activity core will be archived for treatability studies or alternatively subsampled for analysis if the higher activity core from the 4-ft interval exceeds handling limits. This approach avoids compositing, which would increase personnel radiological exposures. Preliminary soil volume estimates for analytical requirements are about 1,270 cm^3 per sampling location. A 2-ft section of 2.125-in. ID sample tube will yield about 1,400 cm^3 of soil if recovery is 100%, which will provide an adequate volume of material for analysis. If recovery is less than 100%, materials will be obtained from both 2-ft cores per 4-ft interval for analysis. If recovery from both liner sections is insufficient to allow complete analysis, the analysis types will be prioritized as follows: radionuclides > toxicity characteristic leaching procedure (TCLP) metals > total metals > TCLP organics > target analyte list organics > pH > nitrate/nitrite.

The specific 2-ft core(s) used to compose the sample submitted from each 4-ft interval, as well as gamma survey results, will be documented. Excess material will be labeled and archived for use in treatability studies.

Figure 4-6 shows the direct-push dual-tube sampling sequence. One set of rods is driven into the ground as an outer casing. These rods receive driving force from the hammer and provide a sealed hole from which soil samples may be recovered without the threat of cross-contamination. The second, smaller set of rods is placed inside the outer casing and is advanced along with the outer casing. The smaller rods hold a sample liner in place as the outer casing is driven down one sampling interval. The small rods are then retracted to retrieve the filled liner while the outer rods are left in place. After any needed decontamination, the sampling tool and inner rods can then be reinstalled down the center of the drive casing, and sampling can continue to the next sampling interval.

The dual-tube sampling system is recommended in sandy or loamy soils where the borehole might collapse. The outer tubing acts as a support for the borehole and allows the soil sample to be collected without the risk of inadvertently collecting soil from shallower depths that fell into the open borehole. The dual-tube soil sampling system is also recommended for use in highly contaminated soils. The outer tube prevents cross-contamination of a soil sample with material from other depths.

RadCon will survey samples using a hand-held instrument (Ludlum 2A or equivalent) as they are withdrawn from the corehole. Specifications regarding handling of soil samples at various contact radiation levels (i.e., opening sample liners, transferring soil from the liner to sample bottles, storage of samples) will be addressed in a radiological work permit (RWP) and in an "as low as reasonably achievable" (ALARA) review as well as in procedures produced as part of the technical approach document. These documents will be developed prior to commencing field activities.



DT32 Sampling Sequence (from left to right):

Tools string is driven from ground surface to fill liner with soil.
Sample is retrieved with inner rod string.
New liner and additional lengths of inner rod and outer casing are added to tool string.
Tool string is once again driven to fill liner with soil.
Second sample is retrieved with inner rod string. Process is repeated until desired sampling depth is reached.

Figure 4-6. Direct-push dual-tube sampling sequence (from Geoprobe Systems® Tools Catalog, Volume 6).

All samples not shipped in the sample liners will be placed in pre-cleaned and laboratory-certified bottles provided by the laboratory and prepared in accordance with EPA bottle-washing procedures and preservation requirements as required by the particular analytical method employed. All samples will be properly preserved and stored until they are shipped to the appropriate analytical laboratory per requirements outlined in the QAPjP (DOE-ID 2004b), RWP, ALARA review, and written procedures. If the radioactivity present in the soil samples is such that handling must be minimized, then the soil samples will be left in the sample liner. The samples will be collected by cutting the liner into lengths containing the required amount of soil, capping the ends of the sections of core tube, labeling the core section appropriately, and delivering the sample to the laboratory.

All Phase 2 coreholes will be gamma logged, after samples are collected, for in situ calibration. Gamma sonde readings in counts per second will be correlated to total gamma emitters in soil collected from the core for each interval.

4.4.2 Quality Control Samples

Specifics regarding type and number of QC samples to be collected during the soil sampling field exercise are outlined in Section 3.3 of this FSP. QC sample requirements are included in the SAP tables provided in Appendix B of this FSP.

Duplicate samples will be collected according to specifications in Section 3.3 and in the SAP tables and in accordance with worker safety requirements outlined in the RWP and the ALARA review.

Equipment rinsate samples will be collected, as appropriate, by pouring analyte-free water over the decontaminated sampling equipment and then into the appropriate sample containers.

4.4.3 Field Decontamination Procedures

Field decontamination procedures have been designed to prevent cross-contamination between locations and samples and to prevent offsite contaminant migration. Equipment associated with soil sampling will be thoroughly decontaminated prior to initial use and between sample locations. Equipment blank or rinsate QC samples will be collected as specified in the SAP table provided in Appendix B of this FSP. After decontamination, sampling equipment will be wrapped in foil to prevent contamination from windblown dust. Wet wipes, brushes, and steam cleaners may be used for decontamination.

Due to the nature of the radionuclide contamination in the subsurface, it is likely that new tooling will be used at each sampling location. All used tooling will be treated as IDW and managed according to the *Waste Management Plan for Operable Unit 3-14 Soil and Groundwater Remedial Investigation/Feasibility Study* (INEEL 2004b) found in Appendix C of the OU 3-14 RI/FS work plan. All unused sample material will be stored in a 35- or 55-gal steel drum and treated as IDW. Decontamination procedures will follow established procedures as discussed in the RWP and ALARA review.

4.4.4 Sample Screening, Packaging and Shipping

All samples collected from radiologically contaminated areas will be field-screened for external contamination by the RCT prior to being released from the project work site. The RCT will determine if samples meet the release criteria as documented in the radiological work permit. All samples will receive a shipping screening as required. In accordance with U.S. Department of Transportation (DOT) regulations and current company policies, a company-certified hazardous materials shipper will transfer all hazardous materials.

Sample packaging requirements for movement within INTEC will be determined by RadCon and will be based on the activity observed for the samples and on the INTEC laboratory sample-receiving requirements.

4.5 Phase 2 Sample Collection for Treatability Studies

Samples may be collected and archived for possible use in treatability studies to support the feasibility study analysis of remedial alternatives. If possible, these samples will be obtained from excess sample not required for analysis. Preliminary soil volume estimates for analytical requirements and treatability study sample material are about 1,270 and 2,500 cm^3, respectively, per sampling location, assuming that a tiered treatability testing approach is used, wherein cold surrogate materials are used for initial screening of formulations. A 2-ft section of 2.125-in. ID sample tube will yield about 1,400 cm^3 of soil if recovery is 100%, which will provide an adequate volume of material for analysis. If recovery is less than 100%, materials will be obtained from both 2-ft sections per 4-ft interval for analysis. Excess material will be labeled and archived for use in treatability studies.

5. MEASUREMENT METHODS

This section outlines in detail the methods to be followed for completion of the Phase 1 subsurface gross gamma-radiation logging and analytical methods for Phase 2 soil sampling.

5.1 Phase 1 Subsurface Gross Gamma-Radiation Logging

Subsurface radiation logging will be conducted using a downhole high-density bismuth germanium oxide (BGO) gamma-detector logging tool or equivalent. The actual gamma-logging tool and operating procedures will be identified in the technical approach document, based on the requirements. The gamma-ray logging tool will be operated in move-stop-acquire mode to detect and record gross gamma-radiation flux with depth. The suggested depth increment is 6 in. along the probehole length. Gross gamma is recorded at each depth increment at 100 counts per second for 10 seconds (this constitutes a logging time of 3 ft per minute under normal conditions). Systems of this type can achieve a minimum detection level of 3 pCi/g for Cs-137 in soil surrounding the casing. A minimum in situ detection limit of 110 pCi/g Cs-137 is required to resolve DQO Decision Statement #1 (see Section 5 of the work plan [DOE-ID 2004a]). The depth position recorded with each survey interval is measured from ground surface. The OD of the logging tool is 1.65 in., and the length of the tool is less than 30 in.

Log surveys will be examined to locate areas of subsurface contamination. Correlation between log plots will be used as a basis to estimate the combined horizontal and vertical extent of continuous contamination zones.

5.1.1 Site Survey

The subsurface radiation-logging subcontractor will find and mark probehole locations using Figures 4-1, 4-2, and 4-5 as guides. Probeholes will be flagged with appropriate markers that include the probehole name. The flagged location will be surveyed to obtain coordinates for each probehole. These coordinates will be referenced to the project-specific coordinate system. In general, the gamma logging will be conducted in each of the new probeholes immediately after completion of each probehole. Information thus obtained may be used to guide subsequent probehole installations.

5.1.2 Mobilize Survey Instrument

Since Cs-137 is historically known to have been present in each of the tank farm release sites, it can be used as an indicator to find other contaminants. Therefore, the logging instrument was chosen specifically for detection of Cs-137 gamma rays (0.662 MeV). Subsurface radiation logging will use a field-portable gamma-ray radiation logging system with the following minimum specifications:

- Energy sensitivity maximum: 2600 keV
- Measurement mode: move-stop-acquire mode
- Tool diameter: less than 41.9 mm (1.65-in.) OD.

5.1.3 Calibrate Instrument

The gamma-ray probe will be calibrated in accordance with industry-recognized procedures in certified probehole calibration models. A section of the driven probe rod will be assembled over the logging sonde during calibration. Calibration in this configuration incorporates the casing thickness correction, because the probe wall thickness is included in the calibration. This method of calibration is more rigorous than applying a casing thickness correction separately during data analysis.

A second field calibration method will also be used. All Phase 2 coreholes will be gamma logged, and the in situ measurements in counts/second will be correlated to laboratory results in pCi/g for total gamma emitters for each interval.

5.1.4 Conduct Field Survey

A downhole gross gamma-radiation survey will be performed in existing probeholes A-53-11 and A-53-19 and in all new probeholes (Figures 4-1, 4-2, and 4-5). Survey measurements will be obtained at a maximum depth interval of 6 in., beginning at the lowest depth obtainable in each probehole and continuing upward to within 1 ft of the ground surface. Gamma-logging operations will be performed according to the manufacturer's specifications and approved procedures as discussed above.

Regular field verification will be performed to ensure that the gamma-survey instrument operates consistently during the course of the downhole-logging program. The field verification procedure will be documented in the subsurface radiation logging subcontractor work procedure. Real-time review of the results will be possible in the field with this logging system. The data will also be backed up separately from the field laptop computer.

Historically, the presence of water has been noted in some of the existing probeholes. A water level measurement will be taken before logging these probeholes. If water is found, the logging probe will be sleeved or otherwise protected to preclude the need for decontamination measures and to protect the probe from damage. The RCT will monitor the equipment according to existing subsurface radiation-logging subcontractor procedures. Smears will be taken before the tool is moved to the next logging location. If required, the subsurface radiation-logging subcontractor will perform all decontamination procedures. The procedure will be in accordance with this FSP and Standard Operating Procedure (SOP)-11.5, "Field Decontamination of Sampling Equipment."

5.1.5 Processing, Analysis, and Final Report

The raw data from the field instrument will be downloaded on a daily basis. Raw data will be processed as necessary to produce final data sets, which for each data point will include well name, depth, and instrument gross gamma-ray reading in counts/sec. A written report will be prepared containing the following:

- Description of field activities
- Description of equipment
- Instrument calibration documentation
- Results including gamma-ray radiation log plots
- Interpretation and recommendations.

5.2 Laboratory Analytical Methods for Phase 2 Soil Samples

This section outlines the laboratory analytical methods to be followed for analyzing soil samples collected at the tank farm. The COPCs and the analytical procedures are listed in Table 5-1. Sample containers, preservatives, minimum volumes, and holding times are listed in Table 5-2. Definitive level data are required for this project. Samples will be analyzed as specified in the QAPjP (DOE-ID 2004b).

Table 5-1. Analysis for contaminants of potential concern and required analytical methods.

Category	Analyte	Method
Radionuclides	Am-241	Alpha spec or gamma spec
	Pu-238	Alpha spec
	Pu-239/240	Alpha spec
	U-233/234	Alpha spec
	U-235	Alpha spec or gamma spec
	U-238	Alpha spec
	Np-237	Alpha spec
	Tritium	Liquid scintillation counter
	Tc-99	Liquid scintillation counter
	Sr-90	Gas proportional counter
	C-14	Gas proportional counter
	I-129	Gas proportional counter or gamma spec
	Cs-137	Gamma Spec
	Eu-154	Gamma Spec
Inorganics	Arsenic	SW-846[a] 7000A[b] or 7062[c]
	Chromium	SW-846 6010/6010B[d]
	Mercury	SW-846 7470A[e] (aqueous) or 7471A[f] (non-aqueous)
Wet Chemistry	Nitrate-N	EPA-300.0[g], 352.1[h], 353.1[i], or 353.2[j]
	Nitrite-N	EPA-300.0[g], 352.1[h], 353.1[i], or 353.2[j]
	pH	SW-846 9045C
Organics	Appendix IX TAL-VOCs	SW-846 8260B[k]
	Appendix IX TAL-SVOCs	SW-846 8270C[l]
TCLP	Metals and organics	SW-846 1311[m]

SVOC = semivolatile organic compound
TAL = target analyte list
TCLP = toxicity characteristic leaching procedure
VOC = volatile organic compound
a. All SW-846 methods cited in this table are extracted from "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods" (EPA 2003).
b. SW-846, Method 7000A, "Atomic Absorption Methods."
c. SW-846, Method 7062, "Antimony and Arsenic (Atomic Absorption, Borohydride Reduction."
d. SW-846, Method 6010/6010B, "Inductively Coupled Plasma-Atomic Emission Spectrometry."
e. SW-846, Method 7470A, "Mercury in Liquid Waste (Manual Cold-Vapor Technique)."
f. SW-846, Method 7471A, "Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique)."
g. EPA Method 300.0, "Determination of Inorganic Anions by Ion Chromatography" (EPA 1993).
h. EPA Method 352.1, "Nitrate (Colorimetric, Brucine)" (EPA 1983).
i. EPA Method 353.1, "Nitrate-Nitrite (Colorimetric, Automated Hydrazine Reduction)" (EPA 1983).
j. EPA Method 353.2, "Nitrate-Nitrite (Colorimetric, Automated Cadmium Reduction)" (EPA 1983).
k. SW-846, Method 8260B, "Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry."
l. SW-846, Method 8270C, "Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry."
m. SW-846, Method 1311, "Toxicity Characteristic Leaching Procedure."

Table 5-2. Sample containers, preservation, minimum volume, and holding time requirements.

Analyte	Preservative	Minimum Mass	Container	Holding Time
Radionuclides				
Am-241	None	5 grams	16 oz squat jar	180 days
Pu-238, 239/240	None	5 grams	16 oz squat jar	180 days
U-233/234,235,238	None	5 grams	16 oz squat jar	180 days
Np-237	None	5 grams	16 oz squat jar	180 days
Tritium	4ºC	5 grams	16 oz squat jar	180 days
Tc-99	None	5 grams	16 oz squat jar	180 days
Sr-90	None	1 gram	16 oz squat jar	180 days
Carbon-14	None	5 grams	16 oz squat jar	180 days
I-129	4ºC	15 grams	16 oz squat jar	28 days
Gamma spec	None	150 grams	16 oz squat jar	180 days
Inorganics				
Metals (CLP TAL)	4ºC	20 grams	30 mL G or P	180 days; 28 days Hg
Wet Chemistry				
Nitrate-N	4ºC	50 grams	60 mL AG or P	48 hours[a]
Nitrite-N	4ºC	50 grams	60 mL AG or P	48 hours[a]
pH	4ºC	20 grams	60 mL AG or P	48 hours[a]
VOCs				
Appendix IX VOCs	4ºC	60 grams	120 mL WMG (minimum headspace)	14 days
SVOCs				
Appendix IX SVOCs	4ºC	90 grams	250 mL WMG	14 days
TCLP				
Metals and organics	4ºC	100 grams	250 mL WMG	14 days

AG = amber glass
CLP = Contract Laboratory Program
G = glass
P = plastic
SVOC = semivolatile organic compound
TAL = target analyte list
VOC = volatile organic compound
WMG = wide-mouth glass
a. Holding time after sample extraction in the laboratory.

6. PERSONAL PROTECTIVE EQUIPMENT, EQUIPMENT DECONTAMINATION, AND WASTE MANAGEMENT PROCEDURES

This section describes the PPE, equipment decontamination, and waste management procedures required for this field effort. Before any sampling activities begin, a pre-job briefing will be held to review the requirements of the FSP, HASP (INEEL 2004a) and other work controlling documentation and to verify that all supporting documentation has been completed. In addition, at the termination of the sampling activities, a post-job review will be conducted in accordance with MCP-3003, "Performing Pre-Job Briefings and Documenting Feedback."

6.1 Personal Protective Equipment

The PPE required for this sampling effort is discussed in the HASP (INEEL 2004a).

Before disposal of used PPE, a hazardous waste determination will be completed by means of the requirements set forth in MCP-62, "Waste Generator Services—Low-Level Waste Management."

6.2 Direct-Push and Hand-Augering Equipment

All direct-push and hand-augering equipment will be steam-cleaned before the tank farm area is entered. Decontamination of direct-push equipment between probeholes is unnecessary, because the probe and steel casing will remain in the ground.

The decontamination methods for the direct-push and hand-augering equipment will ensure containment of all decontamination fluids and dry-brush residuals and will minimize waste and contamination of equipment. Decontamination of nondedicated field equipment (sampling equipment) will be performed per GDE-162, "Decontaminating Sampling Equipment." In addition, evaluation of decontamination measures will be made during the field demonstration. Modifications also will be made, if necessary, to ensure that containment, proper waste segregation, and waste minimization procedures will be in place prior to the start of field activities inside the tank farm.

6.3 Management of Sampling Waste

The IDW generated during the OU 3-14 field investigation may include the following items:

- Contaminated PPE, wipes, bags, and other paper and plastic trash
- Contaminated direct-push drilling and sampling equipment
- Aqueous decontamination solutions
- Unused, unaltered, and altered sample material
- Used sample containers and disposable sampling equipment
- Metal and wood debris (temporary push drilling platforms)
- Vacuum-extracted soils or hand-augered soil cuttings

- Aqueous and liquid organic analytical waste
- Used soil drums
- Tents.

The disposition and handling of waste for this project will be consistent with the *Waste Management Plan for Operable Unit 3-14 Soil and Groundwater Remedial Investigation/Feasibility Study* (INEEL 2004b). Samples will be handled in accordance with MCP-3480, "Environmental Instructions for Facilities Processes, Materials and Equipment," and Program Requirements Document (PRD) -5030, "Environmental Requirements for Facilities, Processes, Materials and Equipment." All waste streams generated from the project will be characterized in accordance with this FSP or MCP-63, "Waste Generator Services - Industrial Waste Management," and will be dispositioned accordingly.

6.3.1 Waste Management

The following items will be covered in the waste management plan (INEEL 2004b):

- Hazardous waste determination
- Waste minimization and segregation
- On-site waste management requirements
- Waste management and final disposal.

7. DOCUMENT MANAGEMENT AND SAMPLE CONTROL

Section 7.1 summarizes document management and sample control. Documentation includes field logbooks used to record field data and sampling procedures, chain-of-custody (COC) forms, and sample container labels. Section 7.2 outlines sample handling and discusses COC, radioactivity screening, and sample packaging for shipment to the analytical laboratories. Section 7.3 references the procedure to be used for revising this document.

7.1 Documentation

The FTL will be responsible for controlling and maintaining all field documents and records and for verifying that all required documents will be submitted to the INEEL Idaho Completion Project Administrative Records and Document Control. All entries will be made in indelible black ink. Errors will be corrected by drawing a single line through the error and entering the correct information. All corrections will be initialed and dated.

7.1.1 Sample Container Labels

Waterproof, gummed labels generated from the SAP database will display information such as the unique sample identification number, the name of the project, sample location, and analysis type. Labels will be completed and placed on the containers in the field before sample collection. Information necessary for label completion will include sample date, time, preservative used, field measurements of hazards, and the sampler's initials.

7.1.2 Field Guidance Form

Field guidance forms verifying unique sample numbers provided for each sample location will be generated from the SAP database. These forms contain the following information:

- Media
- Sample identification numbers
- Sample location
- Aliquot identification
- Analysis type
- Container size and type
- Sample preservation.

7.1.3 Field Logbooks

Field logbooks will be used to record information necessary to interpret the analytical data in accordance with Administrative Records and Document Control format and will be managed according to MCP-1194, "Logbook Practices for ER and D&D&D Projects."

7.1.3.1 Sample Logbooks. The field teams will use sample logbooks. Each sample logbook will contain the following information:

- Physical measurements
- All QC samples
- Sample information (sample location, analyses requested for each sample, sample matrix, gamma survey results)
- Shipping information (collection dates, shipping dates, cooler identification number, destination, COC number, name of shipper)
- Daily area activities
- Daily weather observations.

7.1.3.2 Field Team Leader's Daily Logbook. A project logbook maintained by the FTL will contain a daily chronological summary of the following items:

- All field team activities, including locations worked at
- List of site contacts
- Problems encountered.

This logbook will be signed and dated by the FTL at the end of each day's sampling activities.

7.1.3.3 Site Attendance Logbook. A project logbook maintained by the FTL will contain a daily summary of the following:

- Names of field personnel at the job site
- Company affiliation
- Time of entry into and exiting the job site.

7.1.3.4 Field Instrument Calibration/Standardization Logbook. A logbook containing records of calibration data will be maintained for each piece of equipment requiring periodic calibration or standardization. This logbook will contain logsheets to record the date, time, method of calibration, and instrument identification number. Calibration will be performed in accordance with MCP-2391, "Control of Measuring and Test Equipment."

7.2 Sample Handling

Analytical samples for laboratory analyses will be collected in precleaned, laboratory-certified containers and packaged according to the American Society for Testing and Materials or EPA-recommended procedures. The QA samples will be included to satisfy the QA/QC requirements for the field operation as outlined in the QAPjP (DOE-ID 2004b). Qualified (Sample and Analysis Management-approved) analytical and testing laboratories will analyze the samples.

7.2.1 Sample Preservation

Soil samples will be preserved immediately upon sample collection in accordance with the requirements in the QAPjP (DOE-ID 2004b) and Table 5-2. Soil and rinsate samples and samples requiring cooling to 4°C will be placed in coolers containing frozen, reusable ice immediately after sample collection and survey by RadCon.

7.2.2 Chain-of-Custody Procedures

The COC procedures will be followed in accordance with the QAPjP and MCP-3480, "Environmental Instructions for Facilities Processes, Materials and Equipment," and PRD-5030, "Environmental Requirements for Facilities, Processes, Materials and Equipment." Sample containers will be stored in a secured area accessible only to the field team members.

7.2.3 Transportation of Samples

Samples will be shipped in accordance with the regulations issued by the DOT (49 CFR Parts 171 through 178) and EPA sample handling, packaging, and shipping methods (40 CFR 262.30). Samples will be packaged in accordance with the requirements set forth in MCP-3480 and PRD-5030.

Samples will be surveyed for external contamination and radiation levels after sample collection and before packaging for shipment. The shipping container also will be surveyed for external contamination and radiation levels before removal from the sampling area. Radiological control stickers indicating the survey results will be placed on each container. Removal of containers from the sampling area will be under the discretion of RCTs.

A sample will be sent to the INTEC laboratory for a gamma screening. Results of the screening and process knowledge will be used to scale alpha and beta isotopes in relation to gamma activity, and the total activity will be calculated to ensure that the shipment meets the requirements of 49 CFR, "Transportation."

7.2.3.1 Custody Seals. Custody seals will be placed on all shipping containers in such a way as to ensure that sample integrity is not compromised by tampering or unauthorized opening. The seals will be signed by a member of the field team. Clear, plastic tape will be placed over the seals and the signature to ensure that the seals are not damaged during shipment.

7.2.3.2 On-Site and Off-Site Shipping. An on-Site shipment is any transfer of material within the perimeter of the INEEL. All materials to be shipped on-Site or off-Site will be properly characterized in compliance with DOT requirements under pertinent Department of Energy orders and 49 CFR 173.2, "Hazardous Materials Classes and Index to Hazardous Class Definitions." All shipping containers and related papers and manifests will have the proper shipping names as provided under 49 CFR 172.101, "Purpose and Use of Hazardous Materials Table." Site-specific requirements for transporting samples within INEEL boundaries and those required by the shipping and receiving department will be followed. Shipment within INEEL boundaries will conform to DOT requirements as stated in 49 CFR, "Transportation." Off-Site sample shipment will be coordinated with INEEL Packaging and Transportation personnel, as necessary, and will conform to all applicable DOT requirements.

7.2.3.3 Nuclear Material Control and Accountability. The past sampling and analysis results for soil samples collected in the tank farm indicate that a potential exists for exceeding the minimum reporting quantities specified in PRD-170 and PDD-103, "Nuclear Material Control and Accountability and Nuclear Materials Management." Transfers of accountable nuclear material to, from, and within the

INEEL must be controlled and monitored. Instructions for shipment and receipts of nuclear materials are provided in MCP-2752, “Shipments and Receipts of Nuclear Material.” If required, these will be adhered to through coordination with the appropriate Nuclear Material Custodians and with Packaging and Transportation personnel.

7.3 Document Action Requests

Revisions of this document will follow INEEL MCP-233, “ Process for Developing, Releasing, and Distributing ER Documents.”

8. REFERENCES

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40 CFR 300, 2003, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, Office of the Federal Register, July 2003.

49 CFR, 2003, "Transportation," *Code of Federal Regulations*, Office of the Federal Register, October 2003.

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49 CFR 178, 2003, "Specifications for Packagings," *Code of Federal Regulations*, Office of the Federal Register, October 2003.

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DOE-ID, 2004a, *Operable Unit 3-14 Tank Farm Soil and Groundwater Remedial Investigation/Feasibility Study Work Plan*, DOE/ID-10676, Rev. 1, U.S. Department of Energy Idaho Operations Office, June 2004.

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Appendix A

Operable Unit 3-14 Release Sites with Existing and Proposed Probehole Locations

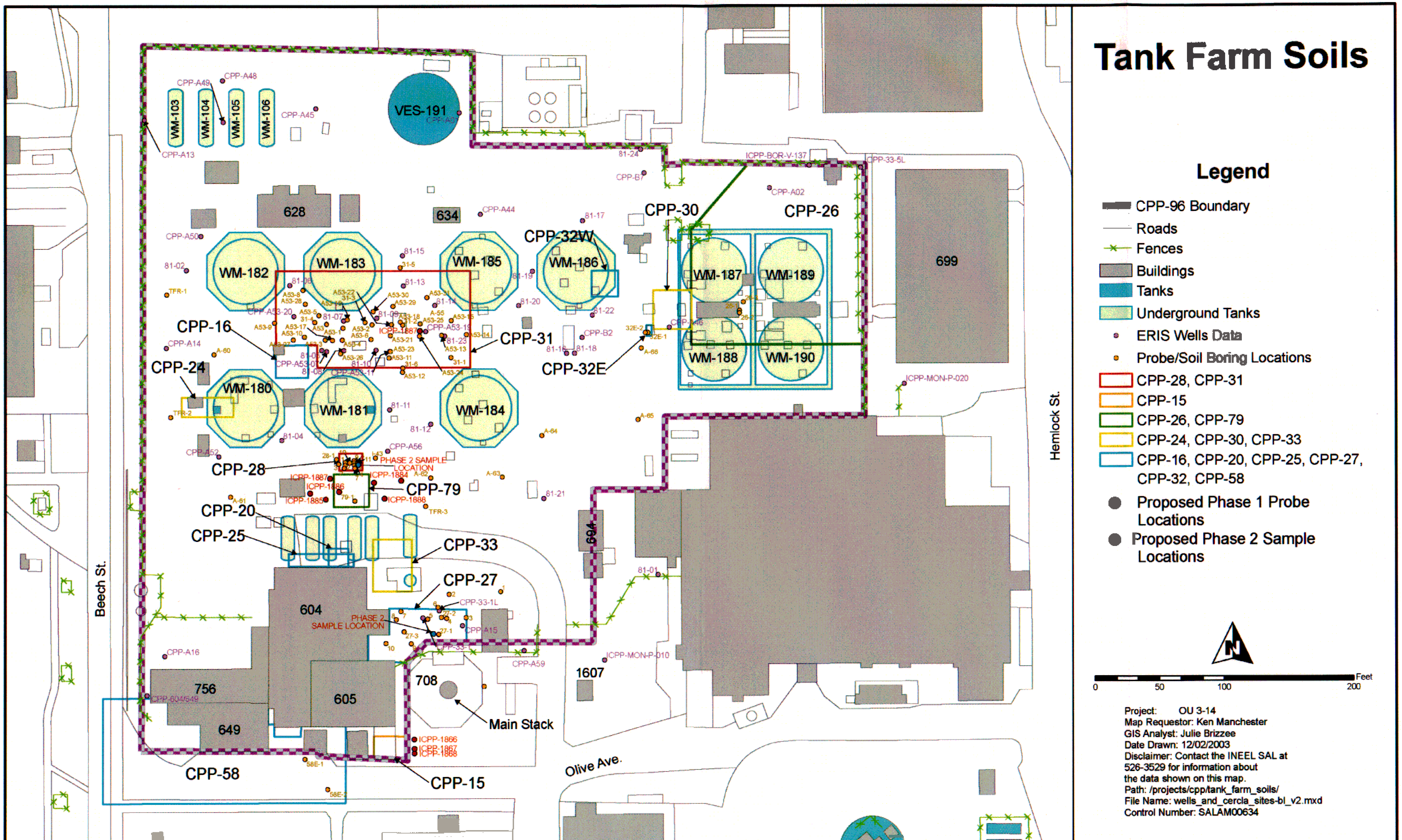

Figure A-1. Operable Unit 3-14 release sites with existing and proposed probehole locations.

Appendix B

SAP Tables for Phase 2 Sampling

DRAFT

Plan Table Number: ESP-051-04

SAP Number: DOE/ID-10764

Sampler: Haney, D. F.

Date: 04/22/2004 Plan Table Revision: 0.0 Project: ESP-051-04, OU 3-14 TANK FARM SOIL CHARACTERIZATION Project Manager: SHANKLIN D. E. SMO Contact: KIRCHNER, D. R.

Sample Description						Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										3A	9A	1A	RH	RN															
E05104000	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-15	0-4	1	1	1	1	1															
E05104001	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-15	4-8	1	1	1	1	1															
E05104002	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-15	8-12	1	1	1	1	1															
E05104003	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-15	12-16	1	1	1	1	1															
E05104004	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-15	16-20	1	1	1	1	1															
E05104005	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-15	20-24	1	1	1	1	1															
E05104006	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-15	24-28	1	1	1	1	1															
E05104007	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-15	28-32	1	1	1	1	1															
E05104008	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-15	32-36	1	1	1	1	1															
E05104009	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-15	36-40	1	1	1	1	1															
E05104010	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-15	40-44	1	1	1	1	1															
E05104011	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-15	44-48	1	1	1	1	1															
E05104012	REG/QC	SOIL	DUP		6/1/2004	CPP	PROBE HOLES	CPP-27	0-4	2	2	1	2	2															
E05104013	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-27	4-8	1	1	1	1	1															
E05104014	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-27	8-12	1	1	1	1	1															

The sampling activity displayed on this table represents the first 6 to 9 characters of the sample identification number. The complete sample identification number will appear on the sample labels.

AT1: Analysis Suite #1
AT2: Analysis Suite #2
AT3: Archive
AT4: Radiochemistry - Suite 1
AT5: Radiochemistry - Suite 2
AT6:
AT7:
AT8:
AT9:
AT10:

AT11:
AT12:
AT13:
AT14:
AT15:
AT16:
AT17:
AT18:
AT19:
AT20:

Comments:
Total Metals (TAL) - Arsenic, Chromium, Mercury
Archive - Future Treatability Studies
Acid/Base Potential = Acidity

Analysis Suites:
Analysis Suite #1: VOCs (Appendix IX TAL), SVOCs (Appendix IX TAL), Total Metals (TAL), TCLP SVOCs, TCLP Metals, TCLP VOCs
Analysis Suite #2: Nitrate/Nitrite - Speciated, Acid/Base Potential, Hydrogen Ion (pH)
Radiochemistry - Suite 1: Am-241, C-14, Tc-99, Np-237, Gamma Spec, Pu-Iso, U-Iso, Sr-90
Radiochemistry - Suite 2: Tritium, Iodine-129

Contingencies:

Plan Table Number: ESP-051-04

DRAFT

SAP Number: DOE/ID-10764

Sampler: Haney, D. F.

Date: 04/22/2004 Plan Table Revision: 0.0 Project: ESP-051-04, OU 3-14 TANK FARM SOIL CHARACTERIZATION Project Manager: SHANKLIN D. E. SMO Contact: KIRCHNER, D. R.

Sample Description						Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
										AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	3A	9A	1A	RH	RN															
E05104015	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-27	12-16	1	1	1	1	1															
E05104016	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-27	16-20	1	1	1	1	1															
E05104017	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-27	20-24	1	1	1	1	1															
E05104018	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-27	24-28	1	1	1	1	1															
E05104019	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-27	28-32	1	1	1	1	1															
E05104020	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-27	32-36	1	1	1	1	1															
E05104021	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-27	36-40	1	1	1	1	1															
E05104022	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-27	40-44	1	1	1	1	1															
E05104023	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-27	44-48	1	1	1	1	1															
E05104024	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-28	0-4	1	1	1	1	1															
E05104025	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-28	4-8	1	1	1	1	1															
E05104026	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-28	8-12	1	1	1	1	1															
E05104027	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-28	12-16	1	1	1	1	1															
E05104028	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-28	16-20	1	1	1	1	1															
E05104029	REG/QC	SOIL	DUP		6/1/2004	CPP	PROBE HOLES	CPP-28	20-24	2	2	1	2	2															

The sampling activity displayed on this table represents the first 6 to 9 characters of the sample identification number. The complete sample identification number will appear on the sample labels.

AT1: Analysis Suite #1
AT2: Analysis Suite #2
AT3: Archive
AT4: Radiochemistry - Suite 1
AT5: Radiochemistry - Suite 2
AT6:
AT7:
AT8:
AT9:
AT10:

AT11:
AT12:
AT13:
AT14:
AT15:
AT16:
AT17:
AT18:
AT19:
AT20:

Comments:
Total Metals (TAL) - Arsenic, Chromium, Mercury
Archive - Future Treatability Studies
Acid/Base Potential = Acidity

Analysis Suites:
Analysis Suite #1: VOCs (Appendix IX TAL), SVOCs (Appendix IX TAL), Total Metals (TAL), TCLP SVOCs, TCLP Metals, TCLP VOCs
Analysis Suite #2: Nitrate/Nitrite - Speciated, Acid/Base Potential, Hydrogen Ion (pH)
Radiochemistry - Suite 1: Am-241, C-14, Tc-99, Np-237, Gamma Spec, Pu-Iso, U-Iso, Sr-90
Radiochemistry - Suite 2: Tritium, Iodine-129

Contingencies:

DRAFT

Plan Table Number: ESP-051-04

SAP Number: DOE/ID-10764

Sampler: Haney, D. F.

Date: 04/22/2004   Plan Table Revision: 0.0   Project: ESP-051-04, OU 3-14 TANK FARM SOIL CHARACTERIZATION   Project Manager: SHANKLIN D. E.   SMO Contact: KIRCHNER, D. R.

Sample Description						Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1 3A	AT2 9A	AT3 1A	AT4 RH	AT5 RN	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
E05104030	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-28	24-28	1	1	1	1	1															
E05104031	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-28	28-32	1	1	1	1	1															
E05104032	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-28	32-36	1	1	1	1	1															
E05104033	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-28	36-40	1	1	1	1	1															
E05104034	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-28	40-44	1	1	1	1	1															
E05104035	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-28	44-48	1	1	1	1	1															
E05104036	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-31	0-4	1	1	1	1	1															
E05104037	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-31	4-8	1	1	1	1	1															
E05104038	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-31	8-12	1	1	1	1	1															
E05104039	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-31	12-16	1	1	1	1	1															
E05104040	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-31	16-20	1	1	1	1	1															
E05104041	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-31	20-24	1	1	1	1	1															
E05104042	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-31	24-28	1	1	1	1	1															
E05104043	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-31	28-32	1	1	1	1	1															
E05104044	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-31	32-36	1	1	1	1	1															

The sampling activity displayed on this table represents the first 6 to 9 characters of the sample identification number. The complete sample identification number will appear on the sample labels.

AT1: Analysis Suite #1

AT2: Analysis Suite #2

AT3: Archive

AT4: Radiochemistry - Suite 1

AT5: Radiochemistry - Suite 2

AT6:

AT7:

AT8:

AT9:

AT10:

AT11:

AT12:

AT13:

AT14:

AT15:

AT16:

AT17:

AT18:

AT19:

AT20:

Comments:

Total Metals (TAL) - Arsenic, Chromium, Mercury

Archive - Future Treatability Studies

Acid/Base Potential = Acidity

Analysis Suites:

Analysis Suite #1: VOCs (Appendix IX TAL), SVOCs (Appendix IX TAL), Total Metals (TAL), TCLP SVOCs, TCLP Metals, TCLP VOCs

Analysis Suite #2: Nitrate/Nitrite - Speciated, Acid/Base Potential, Hydrogen Ion (pH)

Radiochemistry - Suite 1: Am-241, C-14, Tc-99, Np-237, Gamma Spec, Pu-Iso, U-Iso, Sr-90

Radiochemistry - Suite 2: Tritium, Iodine-129

Contingencies:

Plan Table Number: ESP-051-04

DRAFT

SAP Number: DOE/ID-10764

Sampler: Haney, D. F.

Date: 04/22/2004 Plan Table Revision: 0.0 Project: ESP-051-04, OU 3-14 TANK FARM SOIL CHARACTERIZATION Project Manager: SHANKLIN D. E.

SMO Contact: KIRCHNER, D. R.

Sample Description						Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										3A	9A	1A	RH	RN															
E05104045	REG/QC	SOIL	DUP		6/1/2004	CPP	PROBE HOLES	CPP-31	36-40	2	2	1	2	2															
E05104046	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-31	40-44	1	1	1	1	1															
E05104047	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-31	44-48	1	1	1	1	1															
E05104048	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-79	0-4	1	1	1	1	1															
E05104049	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-79	4-8	1	1	1	1	1															
E05104050	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-79	8-12	1	1	1	1	1															
E05104051	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-79	12-16	1	1	1	1	1															
E05104052	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-79	16-20	1	1	1	1	1															
E05104053	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-79	20-24	1	1	1	1	1															
E05104054	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-79	24-28	1	1	1	1	1															
E05104055	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-79	28-32	1	1	1	1	1															
E05104056	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-79	32-36	1	1	1	1	1															
E05104057	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-79	36-40	1	1	1	1	1															
E05104058	REG	SOIL	COMP		6/1/2004	CPP	PROBE HOLES	CPP-79	40-44	1	1	1	1	1															
E05104059	REG/QC	SOIL	DUP		6/1/2004	CPP	PROBE HOLES	CPP-79	44-48	2	2	1	2	2															

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AT15:
AT16:
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AT18:
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AT20:

Comments:
Total Metals (TAL) - Arsenic, Chromium, Mercury
Archive - Future Treatability Studies
Acid/Base Potential = Acidity

Analysis Suites:
Analysis Suite #1: VOCs (Appendix IX TAL), SVOCs (Appendix IX TAL), Total Metals (TAL), TCLP SVOCs, TCLP Metals, TCLP VOCs
Analysis Suite #2: Nitrate/Nitrite - Speciated, Acid/Base Potential, Hydrogen Ion (pH)
Radiochemistry - Suite 1: Am-241, C-14, Tc-99, Np-237, Gamma Spec, Pu-Iso, U-Iso, Sr-90
Radiochemistry - Suite 2: Tritium, Iodine-129

Contingencies:

DRAFT

Plan Table Number: ESP-051-04

SAP Number: DOE/ID-10764

Date: 04/22/2004 Plan Table Revision: 0.0 Project: ESP-051-04, OU 3-14 TANK FARM SOIL CHARACTERIZATION Project Manager: SHANKLIN D. E.

Sampler: Haney, D. F.

SMO Contact: KIRCHNER, D. R.

Sample Description						Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										3A	9A	1A	RH	RN															
E05104060	QC	WATER	EQBK		6/1/2004	CPP	QC	EQUIP BLANK	NA	1	1		1	1															

The sampling activity displayed on this table represents the first 6 to 9 characters of the sample identification number. The complete sample identification number will appear on the sample labels.

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Analysis Suite #1: VOCs (Appendix IX TAL), SVOCs (Appendix IX TAL), Total Metals (TAL), TCLP SVOCs, TCLP Metals, TCLP VOCs
Analysis Suite #2: Nitrate/Nitrite - Speciated, Acid/Base Potential, Hydrogen Ion (pH)
Radiochemistry - Suite 1: Am-241, C-14, Tc-99, Np-237, Gamma Spec, Pu-Iso, U-Iso, Sr-90
Radiochemistry - Suite 2: Tritium, Iodine-129

Contingencies: